

This electronic thesis or dissertation has been downloaded from the King's Research Portal at <https://kclpure.kcl.ac.uk/portal/>



The Royal Naval Air Service and the Evolution of Naval Aviation in Britain, 1914-1918

Howlett, Alexander Lucas Nathaniel

Awarding institution:
King's College London

The copyright of this thesis rests with the author and no quotation from it or information derived from it may be published without proper acknowledgement.

END USER LICENCE AGREEMENT



Unless another licence is stated on the immediately following page this work is licensed

under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

licence. <https://creativecommons.org/licenses/by-nc-nd/4.0/>

You are free to copy, distribute and transmit the work

Under the following conditions:

- Attribution: You must attribute the work in the manner specified by the author (but not in any way that suggests that they endorse you or your use of the work).
- Non Commercial: You may not use this work for commercial purposes.
- No Derivative Works - You may not alter, transform, or build upon this work.

Any of these conditions can be waived if you receive permission from the author. Your fair dealings and other rights are in no way affected by the above.

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Department of Defence Studies
King's College London

The Royal Naval Air Service and the Evolution of Naval Aviation in Britain, 1914-1918

Alexander L. N. Howlett

Thesis submitted for the Degree of Doctor of Philosophy

2019

Abstract

The Royal Naval Air Service (RNAS) was a transformative military organisation that established the role of aviation within the Royal Navy during the First World War. The history of the RNAS, despite its immense significance, remains compartmentalized into specialized studies, ultimately overshadowed by the historiography of the Royal Flying Corps (RFC) and the early Royal Air Force (RAF). The important RNAS practitioners who developed Britain's naval aviation between 1914-1918 have as a result been marginalized in comparison to the better known history of the Fleet Air Arm, the organisation that ultimately succeeded the RNAS in the interwar period and beyond. This thesis unifies the historiography of Britain's First World War naval aviation, and reassess the significance of the administrators and practitioners who created Britain's naval air power.

Utilizing a thematic approach this thesis evaluates the successes and failures of Britain's naval aviation development during the First World War. Through an examination of the history of the RNAS, the thesis considers the evolution of four aspects of Britain's naval aviation: airpower for the fleet, anti-submarine warfare (ASW), the Royal Navy's pioneering introduction of long-range bombing, and the maritime air defence of Britain. The thesis concludes that the RNAS functioned not only as an auxiliary to the Navy's existing and traditional roles, but also changed the fundamental manner in which operations were conducted, whether at sea, over land, or in the air. The RNAS pioneered many of the aspects of naval aviation and airpower that are considered core roles of naval air forces today, however, the practitioners who made possible this revolution in warfare and the administrators who oversaw it remain relatively obscure. Wartime prioritization, technological improvement (and limitations), inter-service debate and indeed personal and service-wide rivalries, all shaped the Royal Navy's approach to naval aviation. The thesis argues that a gradual transformation occurred over the course of the war, with naval aviation emerging from an uncertain auxiliary to a decisive instrument.

Acknowledgements

My thesis advisor Dr. Tim Benbow deserves the most credit for encouraging me to complete this thesis. Tim provided incisive feedback, ensured the project stayed manageable and on time, tirelessly read all of the draft files, and provided invaluable wisdom and support along the way. My secondary advisors, Professor Andrew Lambert and Dr. Christina Goulter, have both helped me more than they know. Andrew has been a friend since we first met in his graduate naval history seminar in 2008, and his example, guidance and enthusiasm have shaped my approach to historical writing and scholarship ever since. Andrew has been an inspiration. Christina encouraged me to approach the project holistically, and reminded me not to shy away from controversial topics, of which the history of Britain's naval aviation certainly has its share. Her own pioneering research on the RNAS and RAF helped steer me in the right direction.

Special thanks is due to a number of individuals, all of whom helped me in ways both large and small. I owe particular thanks to Jordan Marliave, Guy Birks, T. J. Linzy, Jason and Shaun Campbell, Ryszard, Matt and Mike Krukowski, Timothy Choi, Louis Halewood, Mike Thornley, James Boxall, Daragh Markham, Darren Oke, David Zhou, Matthew Bento, Anna Brinkman-Schwartz, Paul Garfinkel, Weiting Guo, David Kohnen, John Abbatiello, Ross Mahoney, Dennis Haslop, Reda Hassan El Ashi, Steven Klein, James Pugh, Andre Gerolymatos, Roxanne Panchasi, James Goldrick, Matthew Seligmann, Duncan Redford, John Ferris, David Morgan-Owen, Lewis Pulsipher, Nicholas Jellicoe, B. J. Armstrong, Innes McCartney, Eric Grove, Trent Hone, Christopher Bell, Laurence Burke, Alan James, Nicholas Rodger, and all of the staff at every archive I visited, where my requests were always met with encouragement and accommodation.

My wonderful family, a source of bottomless love and amazement, deserve more credit than I can express. My parents, Michael and Rebecca, both specialists in their respective fields, volleyed ideas and literature my way, and were always willing to listen. My sister, Anna, was there for me when I needed her, and our adventures have always been exceptional. Thanks is also due to Brian, Maureen, Rebecca, Alicia, and Daniel Chatfield, Sean Howlett, Matthew and Kyle Lorimer, the greatest family anyone could hope for. Lastly, I offer humble thanks to Leah, my brilliant and herculean wife and companion, whose dedication and depth of knowledge are incomparable. Without the love of my family, friends, and colleagues, this thesis simply would not exist.

Table of Contents

Abstract	2
Acknowledgements	3
Table of Contents	4
Glossary of Abbreviations	6
Chapter One: Introduction	8
Research Question	10
Thesis Contribution	12
Source Material and Scope	12
Thesis Structure	16
Chapter Two: Literature Review	21
Fleet Naval Aviation and Aircraft Carrier History	22
Gunfire Spotting, the Dardanelles, German East Africa	31
The Battle of Jutland, The Flying Squadron and the Tondern Raid	32
Anti-Submarine Warfare and Convoy Protection	34
The War Zone, and the Development of Non-Rigid Airships	37
Jellicoe at the Admiralty and Reforming the Air Department	39
Air Division of the Naval Staff and the Creation of the RAF	41
Long-Range Bombing, Dunkirk, No. 3 Wing, and the 41st Wing RFC	42
Anti-Zeppelin Shed Raids in 1914, RNAS Dunkirk & No. 3 Wing, Luxeuil	43
RFC 41st Wing and the Independent Force of the RAF	46
Air Defence of Britain, Zeppelin and Gotha Raiders	47
Gotha Raids of 1917, the Debate to Create the RAF, ‘The First Blitz’	49
Conclusion of the Literature Review	51
Chapter Three: Fleet Naval Aviation	53
Naval Airships: Unexpected Results	54
Origin of the Aircraft Carrier	64
Anti-Zeppelin: Fleet Aviation in the North Sea from Cuxhaven to Jutland	69
RNAS Raiding Resumed, the Impact of Jutland and the 1916 Reforms	73
The Wilhelmshaven Plan of 1917	77
Gunfire Spotting: Impact of the Dardanelles & East Africa in 1915	81
Kite-Balloon Carriers in the Mediterranean	86
The East Indies & Egypt Seaplane Squadron	89
The Grand Fleet Air Committee Reforms in 1917	94
Rear-Admiral Phillimore, Admiral Commanding Aircraft, and the Flying Squadron	103
Conclusion	105
Chapter Four: Anti-Submarine Warfare	108
Aircraft Against Submarines: Prewar Theory	112

The Introduction of Unrestricted Submarine Warfare, 1914 – 1916	118
Expansion of the Patrol Schemes During 1916	122
The Air Department and the 1917 Reforms	125
Accounting RNAS Anti-Submarine Victories in 1917-18	134
The Convoy System and Air Escort	140
The Royal Air Force and the Air Division of the Naval Staff in 1918	144
Conclusion	150
Chapter Five: Long-Range Bombing	155
Churchill and the Anti-Zeppelin Raids of 1914	156
The Dunkirk Wing and Long-Range Bombing in Belgium	158
Admiral Keyes and the Offensive Renewed	163
Naval Bombing of German Industry, Vaughan-Lee & No. 3 Wing	166
Bombing Commences, No. 3 Wing Successes in 1916-1917	169
Assessing the Impact of No. 3 Wing	175
The 41 st Wing and RNAS No. 16 Squadron	176
The Independent Air Force	180
Conclusion	184
Chapter Six: Air Defence of Britain	187
Churchill's Prewar Policy, Air Defence, 1912-1915	188
Churchill, Sueter, and Building Britain's Air Defences	191
Balfour: Re-organisation and the Anti-Zeppelin Arms Race	195
The Importance of Signals Intelligence and Reconnaissance	200
1916, Re-armament, Re-training	203
Britain's Air Defence in 1917 – 1918: Defeat of the Zeppelins, Beginning of the Gotha Raids	209
Decline: Naval Air Defence in 1918, and After the Creation of the RAF	216
Conclusion	219
Chapter Seven: Conclusion	221
The Impact of Naval Administration and Government Policy on the RNAS	223
The Practitioners and their Contributions to Naval Aviation's Development	228
Technical Innovation and Material Limitations	233
Conceptualizations of Naval Aviation During the First World War	235
Bibliography	238
Primary Sources	238
Secondary Sources	246

Glossary of Abbreviations

ACA	– Admiral Commanding Aircraft
ACNS	– Assistant Chief of the Naval Staff
ADAS	– Assistant Director Air Services
ADNC	– Assistant Director of Naval Construction
AFB	– German naval code, 1916
A/S	– Anti-Submarine
ASA	– Assistant Superintendent for Airships
ASAC	– Assistant Superintendent for Aircraft Construction
ASD	– Anti-Submarine Division
ASDIC	– Anti-Submarine Division Supersonics, early Sound Navigation and Ranging
ASW	– Anti-Submarine Warfare
BCF	– Battle Cruiser Fleet
BEF	– British Expeditionary Force
BIR	– Board of Invention and Research
CAS	– Chief of the Air Staff
CFS	– Central Flying School (Upavon)
CCC	– Churchill College archives, University of Cambridge
CID	– Committee of Imperial Defence
CIGS	– Chief of the Imperial General Staff
C-in-C	– Commander-in-Chief
CNS	– Chief of the Naval Staff
<i>CCLIJ</i>	– <i>Cross & Cockade International Journal</i>
DAD	– Director Air Department (1912 - 1915), Director Air Division (1918)
DAS	– Director Air Services (1915 – 1916)
DASD	– Director Anti-Submarine Division
DCNS	– Deputy Chief of the Naval Staff
D/F	– Direction Finding
DGMA	– Director General of Military Aeronautics
DOD	– Director Operations Division
DNC	– Director Naval Construction
EIESS	– East Indies & Egypt Seaplane Squadron
FAA	– Fleet Air Arm
<i>FDSF</i>	– Arthur Marder, <i>From the Dreadnought to Scapa Flow</i> , 5 vols (Annapolis: Naval Institute Press, 2013-14, originally published 1961-70).
GFAC	– Grand Fleet Air Committee
GFAO	– Grand Fleet Air Orders
GFBI	– Grand Fleet Battle Instructions

GFBO	– Grand Fleet Battle Orders
GHQ	– General Headquarters, British Expeditionary Force
GOC	– General Officer Commanding
HMAS	– His Majesty’s Australian Ship
HMS	– His Majesty’s Ship
HVB	– German naval code, 1914-1915
IWM	– Imperial War Museum archives, London
<i>JRUSI</i>	– <i>Journal of the Royal United Services Institute</i>
JSCSC	– Joint Services Command and Staff College, Shrivenham, library
JWAC	– Joint War Air Committee
LADA	– London Air Defence Area
LHCMA	– Liddell Hart Centre for Military Archives, King’s College London
NAS	– Naval Air Station
NMM	– National Maritime Museum archives, Greenwich
<i>NRJ</i>	– <i>Naval Review Journal</i>
<i>ODNB</i>	– <i>Oxford Dictionary of National Biography</i>
RAC	– Rear-Admiral Commanding
RAF	– Royal Air Force
RFC	– Royal Flying Corps
RNAS	– Royal Naval Air Service
RNVR	– Royal Navy Volunteer Reserve
SAC	– Superintendent for Aircraft Construction
SFO	– Senior Flying Officer
SNO	– Senior Naval Officer
TNA	– The National Archives, Kew
UB	– U-boat Coastal
UC	– U-boat Minelayer
USN	– United States Navy
USS	– United States Ship
VAC	– Vice-Admiral Commanding
<i>WIA</i>	– Sir Walter Raleigh and H. A. Jones, <i>The War In The Air</i> , 6 vols, reprint (Uckfield: The Naval & Military Press Ltd, originally published 1922-37).
W/T	– Wireless-Telegraphy

Chapter One: Introduction

This thesis investigates the development of naval aviation in Britain during the First World War. Four thematic roles have been identified as forming the foundation of the Royal Naval Air Service's (RNAS) wartime mission, and these roles are used to frame the thesis investigation. This thesis argues that the hitherto fragmented historiography of the RNAS has obscured its dramatic and transformative impact on naval warfare, the service history has been narrowly defined in terms of special interest studies. Furthermore, the thesis demonstrates that the RNAS was a revolutionary military organisation in its own right, responsible for transforming the Royal Navy's approach to naval warfare in almost every respect.

The RNAS was the service branch responsible for providing the Royal Navy with aerial support during almost the entirety of the First World War. The influence of the RNAS can be seen on the history of the Fleet Air Arm (FAA), the Independent Air Force (IAF) of the Royal Air Force (RAF), and later organisations such as the RAF's Coastal Command and Fighter and Bomber Commands. Although the RNAS was created from the Naval Wing of the Royal Flying Corps (RFC) only a few weeks before Britain entered the First World War, by 1918 the RNAS had become an integrated component of the Royal Navy, building off the traditional roles of the senior service and then branching out to influence all aspects of the war in the air.

The RFC itself was created on 13 April 1912, the result of a recommendation by the Committee of Imperial Defence (CID) sub-committee chaired by the Secretary of State for War, Lord Haldane, with technical support from Colonel J. E. B. Seely. Between November 1911 and February 1912 this committee determined that aviation had reached a point of maturity making possible independent growth.¹ Although nominally part of a unified service, the RFC's aviators and administrators came from diverse backgrounds, bringing unique perspectives on the role of aircraft and airships within the Army and Navy. All Naval Wing personnel would be listed aboard HMS *President*, with an Air Department being created to administer the force at the Admiralty (Naval Wing personnel had previously been attached to HMS *Actaeon* and then HMS

¹ Walter Raleigh, *The War In The Air [WIA]*, vol. I, reprint (Uckfield: The Naval & Military Press Ltd, originally published in 1922), pp. 198-9. Stephen Roskill, ed., *Documents Relating to the Naval Air Service* (London: Spottiswoode, Ballantyne and Co. Ltd., 1969), p. 3.

Hermes).² Taking a keen interest in the technology of aviation, First Lord of the Admiralty Winston Churchill cultivated the Naval Wing into a quasi-private air force under the leadership of Captain Murray Sueter, the Director of the Admiralty's newly established Air Department (DAD).³

Churchill's impact on the pre-war development of naval aviation was immense. The political and strategic situation that underpinned Churchill's appointment is too complicated to expand upon here, but let it suffice to say that Churchill, upon his appointment to the Admiralty, was expected to modernise, rationalize, and reduce spiraling naval costs while maintaining Britain's maritime supremacy *vis-à-vis* the rising naval power of Germany, in particular, addressing the increasing risks to the Royal Navy's freedom of action in the North Sea.⁴ Seaplanes and airships, forming the latest element of the ongoing 20th century naval technology revolution, had the potential to impact every element of Britain's defence, from coastal patrol through to fleet reconnaissance, to the conduct of maritime and amphibious operations ashore and at sea, to the air defence of Britain's vulnerable naval arsenals and dockyards.

On 1 July 1914 the Naval Wing of the RFC was renamed the RNAS, Churchill having decided that, while remaining part of a united air service, the RNAS would act as a military branch of the Navy, similar in nature to the Royal Marines or the Submarine Service.⁵ Within four years of this event the RNAS had become not only the largest naval aviation force in the world, but also a leader in a number of areas ranging from strategic bombing to air defence. The creation of the RAF on 1 April 1918 reunified the divided air services, but did not end the Royal Navy's wartime involvement with naval aviation, which continued under the administration of the Air Division of the naval staff until the beginning of post-war demobilization in 1919.

² Charles Frederick Gamble, *The Story of a North Sea Air Station* (Oxford University Press, 1928). pp. 38-9. See also, The National Archives, Kew (TNA) [hereafter all sources cited are from The National Archives unless otherwise stated], ADM 116/1275.

³ James Pugh, 'The Conceptual Origins of the Control of the Air: British Military and Naval Aviation, 1911-1918' (PhD thesis, University of Birmingham, 2012), pp. 167-73

⁴ Elie Halevy, *The Rule of Democracy, 1905-1914*, trans. E. I. Watkin, vol. VI (London: Ernest Benn Limited, 1961), p. 583. N. A. M. Rodger, *The Admiralty* (Suffolk: Lavenham Press Limited, 1979), p. 127. Paul Kennedy, *The Rise and Fall of British Naval Mastery* (New York: Humanity Books, 1998), pp. 224-9. David Morgan-Owen, *The Fear of Invasion: Strategy, Politics, and British War Planning, 1880-1914* (Oxford University Press, 2017), pp. 203-5.

⁵ Eric Grove, 'Seamen or Airmen? The Early Days of British Naval Flying,' in *British Naval Aviation: The First 100 Years*, ed. Tim Benbow (Farnham: Ashgate Publishing Limited, 2011), pp. 24-5. David Hobbs, *The Royal Navy's Air Service in the Great War* (Barnsley: Seaforth Publishing, 2017), p. 48.

As a result of the significant public interest generated by the centenary of the First World War, literature and new research on all aspects of the war have flourished. Nevertheless, the most recent thesis-length examination of the RNAS and its wartime roles was carried out in 1981, indicating the imperative need for a re-examination. A series of excellent specialised and general studies, such as those by Lewis Pulsipher,⁶ Guy Robbins,⁷ Brad King,⁸ Christina Goulter,⁹ John Abbatiello,¹⁰ Ben Jones,¹¹ Eric Grove,¹² James Pugh,¹³ David Hobbs,¹⁴ and Dennis Haslop,¹⁵ all examining components of the whole and based on dedicated archival research, have made the need for a thematic reassessment of the RNAS even more pressing. A thesis-length reappraisal, specifically addressing the development of the RNAS's wartime roles and focusing on the practitioners, remains a missing element in the literature. This thesis therefore seeks to fill a critical gap in the historiography of the RNAS.

Research Questions

This thesis asks the central question 'how did Britain's naval aviation develop and evolve during the First World War?' Answering this question requires addressing a series of secondary questions: what were the relationships between the service practitioners and their political chiefs, and how did government policy influence naval aviation's development? Who were the significant wartime practitioners? What were their major contributions to the theory and practice of naval aviation? Ultimately, it is necessary to reconstruct the interpersonal debates and administrative decisions that constituted naval aviation policy between 1914 and 1918. The

⁶ Lewis Pulsipher, 'Aircraft and the Royal Navy, 1908-1918' (PhD thesis, Duke University, 1981).

⁷ Guy Robbins, 'The Evolution of the Aircraft Carrier, 1914-1916' (PhD thesis, University of London, 1992).

⁸ Brad King, *Royal Naval Air Service, 1912-1918* (Aldershot: Hikoki Publications, 1997).

⁹ Christina Goulter, 'The Royal Naval Air Service: A Very Modern Force,' in *Air Power History: Turning Points from Kitty Hawk to Kosovo*, ed. Sebastian Cox and Peter Gray (New York: Frank Cass Publishers, 2002), pp. 51–65.

¹⁰ John Abbatiello, 'British Naval Aviation and the Anti-Submarine Campaign, 1917-1918' (PhD thesis, King's College London, 2004), John Abbatiello, *Anti-Submarine Warfare in World War I: British Naval Aviation and the Defeat of the U-Boats* (New York: Routledge, 2006).

¹¹ Ben Jones, 'Ashore, Afloat and Airborne: The Logistics of British Naval Airpower, 1914-1945' (PhD thesis, King's College London, 2007).

¹² Eric Grove, 'Seamen or Airmen?' & 'Air Force, Fleet Air Arm - or Armoured Corps? The Royal Naval Air Service at War,' in *British Naval Aviation*, ed. Tim Benbow, pp. 7-27, 27–56, & Grove, 'The Naval Aviation Controversy 1919-1939,' in *Dreadnought to Daring: 100 Years of Comment, Controversy and Debate in The Naval Review*, ed. Peter Hore (Barnsley: Seaforth Publishing, 2012), pp. 113–27.

¹³ Pugh, 'The Conceptual Origins of the Control of the Air'.

¹⁴ Hobbs, *The Royal Navy's Air Service*.

¹⁵ Dennis Haslop, *Early Naval Air Power: British and German Approaches*, Kindle ebook (London: Routledge, 2018).

thesis conclusion addresses these questions directly, highlighting the contributions of the significant RNAS and Royal Navy practitioners, and analyzes the impact of administrative policy on the evolution of the RNAS.

The RNAS was invested in numerous experimental activities, some of which, such as long-range bombing (see Chapter Five) and the air defence of Britain (see Chapter Six), from hindsight seem perhaps less related to naval aviation than the development of aircraft for the fleet (see Chapter Three) or for ASW (see Chapter Four). Nevertheless, these seemingly unrelated activities formed an important aspect of the RNAS mission and are deserving of as much scrutiny as has been lavished upon the more high-profile subject of aircraft carrier development or the conduct of the submarine war.

As will become evident throughout this thesis, the influence of personal relationships significantly shaped, and advanced - or hindered - Britain's naval aviation development and evolution. While certain individual contributions are well known, others have been completely forgotten. The debates between practitioners and within the RNAS and Air Department are significant, as is the influence of service leadership, not to mention government policy. The thesis conclusion reflects on this military-policy interplay (see Chapter Seven).

This thesis argues that aviation was assimilated by the Royal Navy in a complex and nuanced fashion, at once conforming to existing service traditions and structures, while simultaneously revolutionizing the navy's conduct of warfare at sea. Moreover, naval aviation development during the First World War transcended the war at sea to shape the origins of airpower theory and practice. In this regard the RNAS not only transformed the Navy's capabilities, but also contributed to the broader military revolution that, by the war's conclusion, had become undeniable.¹⁶ Airpower was now a fundamental component of warfare, and the Royal Navy had played an important role shaping it. The path was shaped by wartime priorities and administrative decision points. The practitioners actualized revolutionary change from the ground up. This thesis investigates how this wartime revolution was pursued and achieved.

¹⁶ David Jordan, 'The Genesis of Modern Air Power: The RAF in 1918,' in *Changing War: The British Army, the Hundred Days Campaign and The Birth of the Royal Air Force, 1918*, ed. Gary Sheffield and Peter Gray, Kindle ebook (London: Bloomsbury, 2013), Chapter 10. See also, Alistair McCluskey, 'The Battle of Amiens and the Development of British Air-Land Battle, 1918-45,' in Sheffield and Gray (eds), *Changing War*, Chapter 12. Tim Benbow, *The Magic Bullet? Understanding the Revolution in Military Affairs* (London: Chrysalis Books Group, 2004), pp. 37-46.

Thesis Contribution

This thesis provides a critical missing component in the historiography of Britain's naval aviation during the First World War. This thesis contextualizes the relationship of the RNAS within the Royal Navy, and demonstrates how practitioners and their senior administrators interacted to shape naval aviation policy. The fractured nature of the existing historiography, outlined below in the Literature Review (Chapter Two), has hitherto prevented this important contextualization, and the result is that the RNAS has always been perceived as a local contributor to isolated aspects of the naval war, more often than not relegated to subsidiary consideration. This thesis argues that the RNAS and the Air Department were at the centre of events, playing critical, and in some cases decisive, roles within Britain's overall war effort. To approach the study of naval aviation's origins, or even the First World War more generally, without factoring in the RNAS and the Air Department is to generate a distorted perspective. This thesis seeks to correct that error.

Source Material and Scope

The historical material available to the student of the RNAS is significant, and includes a quantity of memoirs, biographies and autobiographies of RNAS aviators, Royal Navy administrators, officers, technicians and more. This thesis utilizes many sources, here organised into four layers. The first layer, representing governmental material, has been derived from several archives and museums, although the most significant are the National Archives at Kew, the British Library, the Imperial War Museum archives, the Liddell Hart Centre for Military History archives at King's College London, the archives at Churchill College, Cambridge, the RAF Hendon Museum archives, and the National Maritime Museum library archives at Greenwich.

The second layer is composed of autobiographies and private memoirs, some unpublished and held in archives, others published and held by libraries, and some now digitized and widely available. A number of the practitioners discussed here produced standalone historical works related to the history of naval aviation, or other elements of the naval war, that remain invaluable

sources to this day. Examples include the three monographs by Admiral Sir John Jellicoe,¹⁷ the books by the Director of the Air Department, Commodore Murray Sueter,¹⁸ the two volumes on the Dover Patrol produced by Vice-Admiral Reginald Bacon,¹⁹ and the combat memoirs of Wing Commander Charles Samson and Vice-Admiral Richard Bell Davies.²⁰ Unpublished sources include the papers of Commander Hugh Williamson,²¹ held by Churchill College, Cambridge, and the diaries of Rear-Admiral Richard Phillimore,²² held by the Imperial War Museum, London. What these sources all have in common is that they are not official government records, but rather personal histories or monographs, produced by the practitioners themselves.

The third layer of documentation represents the official histories, published with the endorsement of the Admiralty and Air Ministry historical branches, specifically the multi-volume texts by Walter Raleigh and H. A. Jones (*The War in the Air*),²³ and Julian Corbett and Henry Newbolt (*Naval Operations*).²⁴ These important texts provide the researcher with the first systematic attempts to describe the operations and administration of the war in terms of the Royal Navy and RAF. Controversial in some respects, these volumes remain the basis for all investigation into the RNAS, the official history of which was never written, but rather scattered throughout more than eleven volumes of official history. The official histories are supplemented by the documentary collections produced by the Navy Records Society, including the collections on Vice-Admiral David Beatty,²⁵ Vice-Admiral Roger Keyes,²⁶ Admiral Jellicoe,²⁷ and Stephen Roskill's diverse collection of RNAS related documents.²⁸ Although not a substitute for the

¹⁷ John Jellicoe, *The Crisis of the Naval War*, ebook (London: Cassell and Company, Ltd, 1920), John Jellicoe, *The Grand Fleet 1914-1916: Its Creation, Development and Work*, Kindle ebook (London: Not So Noble Books, 1919), John Jellicoe, *The Submarine Peril* (London: Cassell & Co. Ltd., 1934).

¹⁸ Murray Sueter, *The Evolution of the Submarine Boat, Mine and Torpedo, from the Sixteenth Century to the Present Time* (Portsmouth: J. Griffin and Company, 1907), Murray Sueter, *Airmen or Noahs: Fair Play for Our Airmen, the Great 'Neon' Air Myth Exposed* (London: Sir Isaac Pitman & Sons, Ltd., 1928).

¹⁹ Reginald Bacon, *The Dover Patrol 1915-1917*, 2 vols. (New York: George H. Doran Company, 1919).

²⁰ Richard Bell Davies, *Sailor in the Air: The Memoirs of the World's First Carrier Pilot* (Barnsley: Seaforth Publishing, 2008).

²¹ Williamson, Group Captain Hugh Alexander (1885-1979), WLMN, Churchill College Cambridge [CCC].

²² The Private Papers of Admiral Sir Richard Phillimore, Documents. 5615, Imperial War Museum [IWM].

²³ Walter Raleigh and H. A. Jones, *The War In The Air*, 6 vols., reprint (Uckfield: The Naval & Military Press Ltd, originally published 1922-37).

²⁴ Julian Corbett and Henry Newbolt, *Naval Operations*, 5 vol., reprint (Uckfield: The Naval & Military Press Ltd, originally published 1920-31).

²⁵ Bryan Ranft, ed., *The Beatty Papers*, 2 vols. (Brookfield: Gower Publishing Company, 1989).

²⁶ Paul G. Halpern, ed., *The Keyes Papers*, 2 vols. (London: Navy Records Society, 1972).

²⁷ A. Temple Patterson, ed., *The Jellicoe Papers*, 2 vols. (London: Spottiswoode, Ballantyne and Co. Ltd., 1966).

²⁸ Roskill, *Documents Relating to the Naval Air Service* [hereafter *Documents*].

archival records themselves, these specialized volumes provide a core documentary collection that functions as a starting point for advanced research in the archives themselves.

The fourth layer includes the writings of all subsequent modern historians. Significant texts include the five volumes of Arthur Marder's history of the Royal Navy during the First World War,²⁹ Stephen Roskill's biographies,³⁰ Peter Kemp,³¹ Hugh Popham,³² and Ray Sturtivant's,³³ histories of the FAA, and Richard Layman's numerous journal articles and monographs.³⁴ There are also several essential reference books, such as Ray Sturtivant and Gordon Page's invaluable compendium of RNAS aircraft and squadrons,³⁵ Owen Thetford's *British Naval Aircraft since 1912*,³⁶ H. F. King's *Armament of British Aircraft, 1909-1939*,³⁷ and H. A. Jones Appendices volume of *The War In The Air*.³⁸ The important journal literature can be found in a number of excellent sources, the pre-eminent of which is the *Cross & Cockade International Journal (CCLJ)* published quarterly. The RAF's *Airpower Review*, the Royal Navy's *Naval Review Journal (NRJ)* and the *Journal of the Royal United Services Institute (JURSI)*, are the essential academic service journal components of the historiography. Also useful, and importantly digitized, are the archives of Stanley Spooner's *Flight* magazine,³⁹ as well as Colin G. Grey's *The Aeroplane* magazine.⁴⁰ Also online are the *London Times*,⁴¹ and the Parliamentary and House of Lords Hansard records.⁴² More difficult to find is the *Jabberwock*,

²⁹ Arthur Marder, *From the Dreadnought to Scapa Flow [FDSF]*, 5 vols. (Annapolis: Naval Institute Press, 2013).

³⁰ Stephen Roskill, *Admiral of the Fleet Earl Beatty* (New York: Antheneum, 1981), & Roskill, *Churchill and the Admirals* (Barnsley: Pen & Sword Books Ltd, 2004).

³¹ P. K. Kemp, *Fleet Air Arm* (London: Herbert Jenkins Ltd., 1954).

³² Hugh Popham, *Into Wind* (Bath: Hamish Hamilton Ltd., 1969).

³³ Ray Sturtivant, *British Naval Aviation: The Fleet Air Arm, 1917 - 1990* (London: Arms & Armour Press Ltd., 1990).

³⁴ Richard Layman, *Naval Aviation in the First World War: Its Impact and Influence* (London: Chatham Publishing, 1996). Richard Layman, *Before the Aircraft Carrier: Development of Aviation Vessels, 1849-1922* (London: Conway Maritime Press, Ltd., 1989).

³⁵ Ray Sturtivant and Gordon Page, *Royal Navy Aircraft Serials and Units, 1911-1919* (Tonbridge: Air Britain (Historians) Ltd., 1992).

³⁶ Owen Thetford, *British Naval Aircraft since 1912*, 4th ed. (London: Putnam, 1978).

³⁷ H. F. King, *Armament of British Aircraft, 1909-1939* (London: Putnam & Company Limited, 1971).

³⁸ Jones, *WIA: Appendices* (London: The Naval & Military Press Ltd, 1937).

³⁹ Flight Global archive, <<https://www.flightglobal.com/pdfarchive/>>

⁴⁰ *The Aeroplane* magazine, <<https://archive.org/details/aeroplane11911lond>>

⁴¹ The Times of London archive, <<https://www.gale.com/c/the-times-digital-archive>>

⁴² House of Lords historical hansards, <<http://hansard.millbanksystems.com/lords/1910s>>

House of Parliament historical hansards, <<http://hansard.millbanksystems.com/commons/1910s>>

magazine of the Fleet Air Arm Museum, Yeovilton,⁴³ or the important but never digitized *Aerospace Historian* journal.⁴⁴ The material is vast, detailed and constantly increasing as historians continue to publish original and sophisticated histories utilizing untapped sources, interdisciplinary methods, and fresh insight.

The RNAS and the Air Department that administered it have been marginalized in the literature. Too often the historiography focuses on special interests to the exclusion of the organisation as a whole. This thesis examines the archival records, and the secondary literature, to explain how the Royal Navy introduced naval aviation, developed its fundamentals, and then operationalized what is recognizably the entire spectrum of naval airpower principles. The history of the RNAS can only be properly evaluated once situated within the context of the overall air and naval development in Britain during the second decade of the 20th century.

A thematic approach was chosen to structure the thesis and ensure project manageability. The thesis addresses four key themes with the objective of highlighting the interrelationship between roles that would otherwise not have been evident in a strictly chronological approach. Nevertheless, the historical literature and archival material available concerning Britain's experience with military aviation is so vast that significant circumscription has been required, and as a result, certain elements of the complex RNAS operational history have been intentionally excluded: For example, this thesis does not discuss the utilization of RNAS fighter squadrons on the Western Front while they were on loan to the RFC,⁴⁵ however, the impact of the naval bombing squadrons that comprised the 41st Wing and Independent Force are discussed (see Chapter Five). The thesis framework, focused on aerial developments, also excludes the fascinating mechanised and motorized components of the RNAS, such as the armoured car deployments to Belgium in 1914, at Gallipoli in 1915, and in Romania and Russia during 1916-1917.⁴⁶ Likewise the revolutionary introduction of the tank, orchestrated by the Admiralty and Commodore Murray Sueter's Air Department, has been thoroughly examined in specialized studies elsewhere.⁴⁷

⁴³ *Jabberwock*, The Journal of the Society of Friends of the Fleet Air Arm Museum, RNAS Yeovilton. Malcolm Smith, a regular contributor, has reproduced source material in his book, *Voices in Flight: The Royal Naval Air Service During the Great War* (Barnsley: Pen & Sword Military Classics, 2014).

⁴⁴ See for example, Douglas Robinson, 'Zeppelin Intelligence,' *Aerospace Historian*, March 1974.

⁴⁵ H. A. Jones, *WIA*, Appendices (London: The Naval & Military Press Ltd, 1937), pp. 142-4.

⁴⁶ Eric Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?' pp. 27-56.

⁴⁷ Winston Churchill, *The World Crisis*, vol. II, ebook (New York: RosettaBooks, LLC, 2013, originally published in 1923), Chapter 4. See also Murray Sueter, *The Evolution of the Tank: A Record of the Royal Naval Air Service*

Naval aviation continued to evolve during the 1920s and afterwards, although inter-service rivalry, the political situation, and above all, finances, shaped a different dynamic when compared to the situation that had emerged in wartime Britain. This fascinating period has been excluded from the study as outside the temporal boundaries of the thesis.⁴⁸ Unfortunately this means that detailed examination of important cases such as the aerial torpedo attack exercises of 1919 (see Chapter Seven),⁴⁹ or operations in Russia during the Civil War,⁵⁰ have also been set aside. Certain chapters involve lengthier discussions of subjects prior to 1914, particularly in the case of aircraft experiments, seaplane carriers, gunfire spotting, airship construction and submarine history.

Thesis Structure

The thesis is organised into seven chapters, beginning with this introduction and followed by a literature review. The four core chapters after the literature review examine each RNAS role: fleet naval aviation, ASW, long-range bombing, and the air defence of Britain. The seventh chapter presents the thesis conclusions.

After the introduction, Chapter Two reviews the subject literature, providing an overview of the fragmented nature of the RNAS's historiography. The RNAS has evoked controversy amongst naval and airpower scholars alike for more than a century, and the explanation for the sudden rise and politically charged disappearance of the revolutionary naval air organisation reveals a complex web of human interactions and administrative structures that underpin Britain's aviation heritage. The literature review argues that the historiography of the RNAS has traditionally focused on operational and technical details and specialized areas of interest such as the origin of the aircraft carrier or strategic bombing. Modern scholars have done much to revive the importance of the RNAS, but important and critical gaps still remain. The archival material is plentiful and opportunities for further investigation abound.

Caterpillar Experiments (London: Hutchinson & Co. Publishers Ltd, 1937). Ernest Swinton, *Over My Shoulder: The Autobiography of Sir Ernest D. Swinton* (G. Roland, 1951), pp. 154-9. Albert Stern, *Tanks: 1914-1918* (Uckfield: The Naval & Military Press Ltd, originally published in 1919). See also, John Glanfield, *The Devil's Chariots: The Origins and Secret Battles of Tanks in the First World War*, Kindle ebook (New York, Osprey Publishing, 2013), Chapter 3.

⁴⁸ Geoffrey Till, *Air Power and the Royal Navy, 1914-1945, A Historical Survey* (London: Jane's Publishing Company, 1979).

⁴⁹ Hobbs, *Royal Navy's Air Service*, pp. 472-5. Till, *Air Power and the Royal Navy*, p. 143.

⁵⁰ John Smith, *Gone to Russia to Fight: The RAF in South Russia, 1918-1920* (Stroud: Amberley Publishing Plc, 2010).

Chapter Three considers the progressive development of naval aviation with the fleet, in particular this aspect of the historiography includes a number of watershed events, including the creation of seaplane and aircraft carriers, the gunfire spotting missions carried out against the *Königsberg* and against Turkish fortifications at the Dardanelles, the events of the Battle of Jutland, the creation of the Grand Fleet Air Committee (GFAC) in 1917, the Wilhelmshaven strike plan, and the assembling of the Flying Squadron of the Grand Fleet. This chapter focuses geographically on the North Sea and Mediterranean theatres, with an excursion to the Rufiji river delta in Tanzania. As this chapter highlights, although the RNAS developed dramatically with the fleet over the course of the war, material and technical limitations resulted in a number of significant reversals, such as were experienced at the Dardanelles, at Jutland, or in the planning for the Wilhelmshaven strike. The fleet never received the airship coverage Admiral Sir John Jellicoe desired, and Admiral Sir David Beatty was only able to concentrate the fleet's airpower under the leadership of the Admiral Commanding Aircraft (ACA), Rear-Admiral Richard Phillimore, in the final year of the war.

Chapter Four examines the RNAS contribution to anti-submarine warfare (ASW) and the protection of merchant shipping during Germany's U-boat campaigns. Hurried technological progress in 1915 made possible the routine patrol of the North Sea and English Channel, with local Naval Air Station (NAS) commanders taking the initiative to develop organic methods for countering Germany's submarines. The arrival of Admiral Jellicoe as First Sea Lord, and the consequent appointment of Commodore Godfrey Paine as Fifth Sea Lord, was a watershed moment in the history of the ASW campaign for the RNAS. Jellicoe, who was eager to use all available means to reduce shipping losses, reorganised the Naval Staff and created the Air Division under Wing Captain Francis. R. Scarlett, and later Brigadier-General Robert M. Groves, both of whom were involved in the production of training manuals for aerial ASW and convoy escort late in the war.⁵¹

The U-boat campaigns of 1915 and 1916 demonstrated that the Royal Navy, and the Air Department, were not prepared to combat the U-boats on a large scale. The threat posed by Germany's submarines did not become critical until the unrestricted sinking of merchant vessels

⁵¹ Pulsipher, 'Aircraft and the Royal Navy' p. 308. See for example, 'Memorandum by Captain F. R. Scarlett, Director Air Division, Naval Staff, dated 18 March 1918 and undated Minute by Captain W. W. Fisher, Director Anti-Submarine Division' AIR 1/274, #233 in Roskill *Documents*, pp. 639-41.

was reintroduced in 1917. The RNAS became an integral component of the anti-submarine (A/S) system Jellicoe had reformed, with aerial coastal patrol and convoy escort missions identified by subsequent historians as amongst the most important RNAS contributions to the war effort.⁵² Less well understood is the implementation of these measures, and how they fit together with the other RNAS roles. Likewise, debate within the Royal Navy about how best to utilize RNAS resources, whether by aerial bombing of submarine bases or by routine air patrols, has not been fully explored. ASW was very important for the Royal Navy but it was of little interest to the RFC engaged on the Western Front, and thus the RAF, created in April 1918, redistributed former RNAS resources away from ASW. This chapter utilizes a number of unexamined archival records, such as those of the RNAS stations commanders themselves, in addition to the files of the Air Division of the Naval Staff, to provide an original assessment of the RNAS role in terms of ASW.

Chapter Five examines the RNAS involvement with long-range bombing. The ability to bomb strategic targets behind the enemy's lines was an important aspect of the RNAS mission throughout the entire war, although the shifting emphasis of the bombing mission has generally been less well studied than fleet naval aviation or ASW. This chapter examines four areas in which the RNAS pioneered long-range bombing, of which only the first has been thoroughly examined in the literature. Long-range bombing began with raids against Germany's Zeppelin sheds during Churchill's administration, before evolving into an industrial bombing program under Churchill's successor, Arthur Balfour, during which the traditional naval tactic of blockade was extended to Germany's munitions industry.⁵³ The controversial nature of these developments has been denigrated to a certain extent in the literature, with historians tending to perceive the Admiralty's involvement in long-range bombing as a diversion from naval aviation at sea.⁵⁴ The complexity of the issue is highlighted by the case of Wing Captain Lambe's efforts to bomb the dockyards of Germany's submarine bases in Belgium, where the objective, like that of the anti-Zeppelin strikes, was to produce results impacting the war at sea.

The first British attempt at long-range bombing specifically targeting Germany's industrial centres was carried out by Wing Captain William L. Elder's No. 3 (Luxeuil) Wing in

⁵² Pugh, 'Conceptual Origins of the Control of the Air', p. 344. Pulsipher, 'Aircraft and the Royal Navy', p. 356.

⁵³ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?' p. 27.

⁵⁴ Roskill, *Documents*, pp. xvi-ii.

October 1916, and continued into the spring of 1917.⁵⁵ Ostensibly justified as retaliation for Zeppelin raids and submarine attacks against hospital ships, the real purpose of the force was to increase the effectiveness of the Royal Navy's blockade, by directly striking the enemy's production facilities. No. 3 Wing struggled against Army Council opposition while it re-equipped with the powerful Handley Page bombers, and was eventually dismantled under increasing pressure from the War Office and indeed Field Marshal Douglas Haig's General Headquarters (GHQ).⁵⁶ This example is particularly significant considering that, within a few months, it became apparent that retaliatory bombing for the Gotha raids against Britain would need to be carried out. In this final effort, the RNAS contributed two squadrons to the 41st Wing of the RFC at Ochey in 1917, as well as its successor, the Independent Force of the RAF, about which the historiography has so far been practically silent. During this time, however, the RFC was engaged almost entirely in bombing operational targets, such as railways and aerodromes, with industrial bombing taking a backseat. The significance of the Navy's invention of long-range industrial bombing has since become a source of embarrassment for the Air Ministry itself, which assumed the mantle of strategic bombing and even made it the *raison d'être* of the RAF during the interwar period.⁵⁷

Chapter Six investigates the use of naval aviation for the air defence of Britain. Between September 1914 and February 1916 the RNAS was solely responsible for Britain's air defence, which in fact was a larger mission than the Navy was prepared to address. Nevertheless, the DAD Commodore Sueter and Admiralty First Lord Churchill laid the foundation for the military response to the Zeppelin threat through the construction of coastal naval air stations and by developing London's first air defence system. The inability of the naval air arm to stop the Zeppelins from bombing targets in London and south-eastern England, however, despite the Zeppelin shed raids carried out by seaplane carriers and RNAS land planes in 1914 and 1915 (see Chapters Three and Five), exposed the limitations of the Navy's air defences. Eventually, the Admiralty abandoned its land-based air defence program, passing responsibility to the RFC,

⁵⁵ Malcolm Cooper, *The Birth of Independent Air Power* (London: Allen & Unwin, 1986), p. 64. Tami Biddle, 'Learning in Real Time: The Development and Implementation of Air Power in the First World War' in *Air Power History*, p. 8.

⁵⁶ Field Marshal Sir Douglas Haig, C-in-C, British Expeditionary Force, to the War Office, dated from G.H.Q., British Armies in France, 24 February 1917, ADM 1/8449, #162 in Roskill, *Documents*, pp. 473-4.

⁵⁷ James Streckfuss, 'Eyes All Over the Sky: The Significance of Aerial Reconnaissance in the First World War' (PhD Thesis, University of Cincinnati, 2011), p. 262.

and returned instead to strict responsibility for air defence over the sea and coasts.⁵⁸ The result was the development of a system of defence-in-depth, in which RNAS aircraft intercepted enemy bombers over the coasts as they approached Britain and then pursued them as they departed. Combined with RFC and War Office improvements to London's area defence, this system was remarkably successful, first defeating the Zeppelin raids and then quickly adapting to the Gotha raids in 1917. Although the German bombers continued to raid targets in England, in many cases they attacked specifically naval targets and bases, and thus drew bombers away from the civilian centres including London. Here again, as in the case of long-range bombing, the historiography has tended to emphasize the role of the RFC, important to be certain, however, at the expense of the RNAS, thus creating a misrepresentative portrayal of the Navy's contribution to Britain's air defence.

Chapter Seven presents the thesis conclusions. The impact of the RNAS on Britain's conduct of the First World War was profound, both at sea and on land. The Air Department, responsible for administering the RNAS, collected and disseminated operational reports which were published as manuals on training, ASW, airships, bombing, and other theoretical and practical subjects. The changing administrative environment constantly challenged the RNAS to adapt, which was often done with sterling success, although serious setbacks could slow progress. The thesis concludes that the RNAS developed into a revolutionary force, shaped by the practitioners who fought the war. The final merger of the RNAS with the RFC to create the RAF on 1 April 1918 has produced a hundred years of historiography in which the RNAS was perceived as an aberration, and many of its pioneering innovations have since been almost entirely forgotten. The Royal Navy adapted remarkably well to the new technology of airships and aircraft, and in no small measure invented modern airpower as it is known today.

⁵⁸ Jones, *WIA*, vol. III, pp. 154-5.

Chapter Two: Literature Review

This literature review surveys the historiography of the RNAS since the First World War. Four thematic categories, corresponding to the thesis chapters, are examined. The literature review argues that the historiography has become highly fragmented. Historians studying fleet aviation, for example, have tended to argue that the RNAS land-based roles were distractions from the supposedly primary role of naval aviation as an element of the fleet. Land-based airpower proponents, however, have perceived the history of the RNAS as part of the proto-history of the RAF, and thus emphasized the Admiralty Air Department's contribution to the development of long-range bombing and air defence. The role of ASW falls somewhere in the middle. Although recognized as one of the most important contributions of the RNAS to the conduct of the war, the convoy protection and ASW missions were carried out largely by land-based aircraft and airships, and therefore fit in both at sea and land-based camps. The result of this somewhat artificial division of perspective has been an inability to perceive the RNAS in a holistic fashion. This literature review argues that the fractured nature of the historiography, although responsible for producing a wealth of specialized material, has also resulted in the difficulty of perceiving the RNAS in totality, except for the mere handful of comprehensive accounts.¹ The evolution of all four core roles has not been considered together, in parallel.

The fragmentation of the literature is in part the result of popular interest in only particular aspects of aerial conflict during the First World War, predominantly its technical components. For example, the development of rigid and non-rigid airships by the Air Department has generated a number of highly specialized and often under-appreciated studies. However, the focus of research treats the airships as ends in themselves, without providing the context that explains why their development was so important, a situation that afflicts modern and classical publications alike.² Likewise the literature on the Zeppelin raids,³ and the 'first

¹ The most complete accounts are: Pulsipher, 'Aircraft and the Royal Navy' and Hobbs, *Royal Navy's Air Service*. See also, Eric Grove's two chapters in *British Naval Aviation*, pp. 7-55, and Goulter, 'Royal Naval Air Service', pp. 51-64, & Goulter, *A Forgotten Offensive: Royal Air Force Coastal Command's Anti-Shipping Campaign, 1940-1945*, Kindle ebook (Abingdon: Routledge, 2013), pp. 1-33.

² George Whale, *British Airships: Past, Present and Future*, Kindle ebook (New York: Wallachia Publishers, 1919).

³ Neil Storey, *The Zeppelin Blitz*, ebook (Stroud: The History Press, 2015). Michael Belafi, *The Zeppelin*, trans. Cordula Werschkun, ebook (Barnsley: Pen & Sword Aviation, 2015).

London blitz',⁴ are too often portrayed as mere interest pieces, providing a great wealth of detail and information on the subject, but without any serious attempt at contextualization.

The historiography of the RNAS itself, as this review indicates, is balanced on a knife's edge. When considered from a holistic perspective the history of the RNAS is intersectional in terms of its relationship with the political leadership, War Office, RFC, Navy, Admiralty, and eventually, the Air Ministry and RAF. These threads all need to be examined to create a coherent picture of the RNAS and its contribution to the history of airpower and naval aviation. The researcher is not simply studying the history of naval aviation or aircraft carriers in isolation, but rather the entire history of the submarine war, the history of the air war on the western front, and numerous subsidiary theatres ranging from the Dardanelles to the Red Sea and Eastern Africa.

First, the literature on the development of naval aviation for the fleet is analyzed. Second, this chapter examines the literature discussing the controversial role of the RNAS in ASW. Third, the RNAS role in the development of long-range bombing is discussed. Fourth, the RNAS contribution to the air defence of Britain is considered. A brief conclusion presents the final comments on the historiography.

To summarize, the history of the RNAS is diverse although the literature tends towards compartmentalization. The material cross-over with the Air Ministry and RAF has made investigation into the history of the RNAS a perpetually complicated, indeed controversial, affair. By examining the literature through the lens of specific thematic categories it is hoped to provide the clarity required to cut through the confusion, approaching the historiography of the RNAS as a whole rather than a series of fragmented narratives.

Fleet Naval Aviation and Aircraft Carrier History

The history of the RNAS as a component of the fleet is the most thoroughly studied aspect of its history. Often framed as the proto-history of the FAA and shipboard aircraft development,⁵ the

⁴ Ian Castle, *The First Blitz: Bombing London in the First World War* (New York: Osprey Publishing, 2015). Andrew Hyde, *The First Blitz: The German Air Campaign Against Britain, 1917-1918*, Kindle ebook (London: Leo Cooper, 2012). Jonathan Sutherland and Diane Canwell, *Battle of Britain 1917: The First Heavy Bomber Raids on England*, Kindle ebook (Barnsley: Pen & Sword Aviation, 2006).

⁵ Henry Adlam, *The Disastrous Fall and Triumphant Rise of the Fleet Air Arm from 1912-1945*, Kindle ebook (Barnsley: Pen & Sword Aviation, 2014), Chapter 1, loc. 209. David Wragg, *A Century of British Naval Aviation, 1909-2009* (Barnsley: Pen & Sword Maritime, 2009), pp. 1-5. Ray Sturtivant, *British Naval Aviation: The Fleet Air Arm, 1917 - 1990* (London: Arms & Armour Press Ltd., 1990), p. 7. Reginald Longstaff, *The Fleet Air Arm: A Pictorial History* (London: Robert Hale Ltd., 1981), p. 6. Till, *Air Power and the Royal Navy*, p. 31. P. K. Kemp, *Fleet Air Arm* (London: Herbert Jenkins Ltd., 1954), p.5. Kev Darling, *Fleet Air Arm Carrier War: The History of*

literature on this subject has evolved into a coherent narrative, with watershed moments successfully identified. The RNAS is foremost perceived as the initial stepping stone towards the creation of the FAA, assumed to be the inevitable and proper role for Britain's naval aviation. This perspective is too limited, artificially pigeonholing the RNAS as an incomplete FAA, while also disproportionately emphasizing the early history of aircraft carriers, thus ignoring or misrepresenting the other successes of the RNAS. In a similar fashion, the RNAS is perceived as merely a brief split from the unified RFC, that is, the predecessor to the united RAF.⁶ This approach, like the proto-history of the FAA model, also assumes a form of teleology, where the RNAS becomes only a precursor to an inevitable unified air force, rather than a unique organisation in its own right.

The starting point for any history of the RFC (Naval Wing) is the development in Britain of the rigid airship. Other important topics are the deployment of the RNAS to Belgium in September 1914, followed by the role of the RNAS at the Dardanelles, with a detour to the naval gunfire spotting mission against the *Königsberg* in German East Africa, then to 1916 and the controversial RNAS involvement in the Battle of Jutland. The planning for the 1917 Wilhelmshaven raid, and the introduction of the fleet carriers and the Flying Squadron of the Grand Fleet late in the war are frequently discussed, followed by the decline of the RNAS as it is subsumed by the RAF in April 1918. The Tondern raid, carried out by the Grand Fleet's naval aviators from HMS *Furious*, is considered the high water mark for Britain's naval aviation during the war, although this and the post-war aerial torpedo exercises, strictly speaking, were conducted by RAF officers and pilots with the support of the Royal Navy. Taken together, the focus exclusively on the development of fleet naval aviation presents a misleading perspective, biasing the history of the RNAS in favour of its strictly fleet-based components.

There is a significant body of literature on the formative pre-war history of aeronautics and ballooning in the Royal Navy, and the subject is of interest to the history of aviation in Britain during the first decade of the 20th century.⁷ Specialized studies have been conducted on a

British Naval Aviation (Barnsley: Pen & Sword Aviation, 2009), p. 8. Dick Cronin, *Royal Navy Shipboard Aircraft Developments, 1912-1931* (Tonbridge: Air Britain (Historians) Ltd, 1990).

⁶ Ian Philpott, *The Birth of the Royal Air Force*, Google ebook (Barnsley: Pen & Sword Military, 2013). Neville Parton, *The Evolution and Impact of Royal Air Force Doctrine, 1919-1939* (New York: Bloomsbury Academic, 2013), & Parton, 'The Development of Early RAF Doctrine,' in *The Journal of Military History*, vol. 72, no. 4 (October 2008), pp. 1155–78.

⁷ Grove, 'Seamen or Airmen?', pp. 8-20. See also, Bill Finnis, *The History of the Fleet Air Arm: From Kites to Carriers* (Longden Road: Airlife Publishing Ltd., 2000).

number of elements in this developmental period, such as the contribution of Francis McClean, who established what became the Eastchurch school for naval pilots,⁸ or the introduction of Samuel Cody's early naval kites as the background to wartime developments.⁹ These advances culminated in Lord Esher's committee on Aerial Navigation, which recommended what amounted to the first truly watershed event in Britain's naval aviation history, the *RI*, or 'Mayfly', rigid airship project.¹⁰ The unfortunate collapse of this airship in September 1911 dramatically shifted focus amongst the proponents of naval aviation to heavier-than-air machines and non-rigid airships. This was also the time when First Lord of the Admiralty Churchill began to take an active interest in naval aviation as an advanced and potentially revolutionary maritime force.¹¹

Winston Churchill was indeed the godfather of the RNAS. The First Lord of the Admiralty oversaw the growth of the Naval Wing of the RFC with dedication. Randolph Churchill described the development of the naval air service as one of Winston Churchill's, 'most enterprising and successful roles'.¹² Churchill embraced the Navy's offensive tradition, learning to fly with RNAS Eastchurch pilots in the fall of 1913, receiving instruction from Commander Charles Samson, Lieutenant Arthur Longmore, and the soon to be deceased Lieutenant Wildman-Lushington.¹³ Naval aviation, in Churchill's vision, would form another military component of the navy, alongside the Royal Marines.¹⁴ The RNAS offered the promise of unparalleled celerity while also giving the Navy the means to counter an enemy's intrusion into British airspace - a possibility that Bleriot's flight in 1909 had made uncomfortably real. Churchill was not content to sit on the defensive, however, and in the event of war on the European continent planned to commit the RNAS early, with the intention of gaining a decisive

⁸ Phillip Jarrett, *Frank McClean: The Godfather of British Naval Aviation* (Barnsley: Seaforth Publishing, 2011).

⁹ Finnis, *History of the Fleet Air Arm*, pp. 7-9.

¹⁰ C. E. S. Mowthorpe, *Battlebags: British Airships of the First World War* (Stroud: Sutton Publishing, 1998), p. 124.

¹¹ William Manchester, *The Last Lion, Winston Spencer Churchill: Visions of Glory, 1974 - 1932* (Boston: Little, Brown, and Company, 1983), p. 444.

¹² Randolph Churchill, *Winston S. Churchill: Young Statesman, 1901-1914*, ebook, vol. II (Hillsdale College Press, 2015), p. 687.

¹³ Photograph of Winston Churchill learning to fly in a Short-Sommer Pusher Biplane, T2, Eastchurch, Kent, November 1913, IWM CH4779. Arthur Longmore, Part II, RN and RAF, 1911 to 1945, DC 74/102/40, RAF Museum Hendon, p. 5.

¹⁴ Pugh, 'Conceptual Origins of the Control of the Air', p. 307. Gardiner, *The Flatpack Bombers*, Introduction, loc. 305-322. Grove, 'Seamen or Airmen?', p. 22. Manchester, *The Last Lion, Winston Spencer Churchill*, pp. 444-6. Churchill to the Secretary of State for War, Colonel Seely, 6 December 1913, #36 in Roskill, *Documents*, pp. 119-20.

and unexpected advantage. The RNAS was to play a leading role in Churchill's war plans, as Neville Jones phrased it, 'attack was the keynote of the naval policy'.¹⁵

The *R1* airship disaster and the resulting debate between airplane and airship proponents became the starting point for the numerous controversies which have embroiled Britain's naval aviation history. George Whale published an early and in many ways unsurpassed history in 1919,¹⁶ foreshadowing the airship versus airplane debate that dragged into the interwar period. This debate in fact absorbed the interests of the former DAD, now Rear-Admiral (retired) Murray Sueter, and Captain Bernard Acworth, the latter likely under the pseudonym of Neon.¹⁷ The notorious Neon-Sueter controversy played out in the pages of the *Naval Review*, and prompted the publication of Sueter's memoir as a rebuttal.¹⁸ Sueter's response was not well received by the *Naval Review*,¹⁹ and the future of the rigid airship as an aspect of the fleet remained questionable.

It was not until 1961 that another specialized volume on the British rigid airships appeared, that is, Robin Higham's detailed history.²⁰ Higham was followed by Douglas Robinson's history of the rigid airship,²¹ although by now the airship had become a historical curiosity rather than an object of serious military debate. Guy Hartcup published the next general airship history in 1974,²² followed by Patrick Abbott's brief history in 1989,²³ the beginning of the renaissance in naval history that produced a wealth of resources on niche elements of the First World War, including the RNAS. The most useful modern monographs are the British airship history by C. E. S. Mowthorpe,²⁴ and the invaluable research of Malcolm Fife on Britain's airship bases.²⁵ Ultimately the Grand Fleet did receive its rigid airships (see Chapter

¹⁵ Neville Jones, *Origins of Strategic Bombing*, p. 48.

¹⁶ Whale, *British Airships*.

¹⁷ J. M. Spaight, *Air Power And The Next War* (London: Geoffrey Bles, 1938), p. 50.

¹⁸ A. C. Dewar, 'Review of: The Limitations of Aircraft, The Great Delusion', in *The Naval Review [NRJ]*, vol. 15, no. 2 (1927), p. 380. Murray Sueter, *Airmen or Noahs: Fair Play for Our Airmen, the Great 'Neon' Air Myth Exposed* (London: Sir Isaac Pitman & Sons, Ltd., 1928).

¹⁹ Acworth [Neon], 'Review of Airmen or Noahs. The Great 'Neon' Air Myth Exposed', in *NRJ*, vol. 16, no. 3 (1928), p. 559.

²⁰ Robin Higham, *The British Rigid Airship, 1908-1931: A Study in Weapons Policy* (London: G. T. Foulis & Co. Ltd, 1961). See also, Higham, 'The Peripheral Weapon in Wartime: A Case Study,' in *Naval Warfare in the Twentieth Century 1900-1945*, ed. Gerald Jordan (London: Croom Helm, 1977).

²¹ Douglas Robinson, *Giants in the Sky: History of the Rigid Airship* (London: G. T. Foulis & Co. Ltd., 1973).

²² Guy Hartcup, *The Achievement of the Airship: A History of the Development of Rigid, Semi-Rigid, and Non-Rigid Airships* (London: David & Charles, 1974).

²³ Patrick Abbott, *The British Airship at War, 1914-1918* (Terrence Dalton, 1989).

²⁴ Mowthorpe, *Battlebags*.

²⁵ Malcolm Fife, *British Airship Bases of the Twentieth Century* (Fonthill Media Limited, 2015).

Three), although so late in the war that their fleet reconnaissance function had clearly been supplanted by aircraft carriers, catapult aircraft, seaplanes and flying boats. The non-rigid airship, on the other hand, played an important role in the A/S and protection of merchant shipping campaigns, and significant secondary literature has also been dedicated to this unique effort (see Chapter Four).

By 1919 the Royal Navy had developed a large carrier force including the converted HMS *Furious* and HMS *Vindictive*, the flat-topped HMS *Argus*, with the converted HMS *Eagle* and the first ground-up carrier HMS *Hermes* under construction.²⁶ Despite these developments the permanence of the Admiralty's control over air assets had been thrown into doubt. The extensive literature related to the development of these revolutionary ships has reflected their importance, however, the tendency has been to focus on the evolution of the flat-top aircraft carrier to the exclusion of the less glamorous but more significant seaplane carriers, no doubt the result of the high profile role played by modern aircraft carriers in every maritime conflict since 1939.

Several specialized sources on aircraft carrier development between 1914 and 1918 are of particular note. Richard Layman's monograph on the aircraft carrier's origins provides a general introduction to the development of the aircraft carrier during the First World War.²⁷ In 1992 Guy Robbins completed a PhD thesis on aircraft carrier development,²⁸ which he followed with a book version that also covered carrier development during the interwar period and the Second World War.²⁹ Most recently, David Hobbs has produced several useful volumes on the history of the Royal Navy's aircraft carriers.³⁰ Foremost amongst these is his general history of the RNAS itself, a rare attempt at a comprehensive history, accompanied by many excellent photographs.³¹ Hobbs' history certainly represents the most complete account since Lewis Pulsipher, although,

²⁶ Till, *Air Power and the Royal Navy*, p. 60. Richard Layman, *Before the Aircraft Carrier: Development of Aviation Vessels, 1849-1922* (London: Conway Maritime Press, Ltd., 1989), p. 57, 62, 66. Guy Robbins, *The Aircraft Carrier Story 1908-1945* (London: Cassel & Co, 2001), pp. 64-72.

²⁷ Richard Layman, *Naval Aviation in the First World War: Its Impact and Influence* (London: Chatham Publishing, 1996), p. 102.

²⁸ Robbins, 'The Evolution of the Aircraft Carrier, 1914-1916.'

²⁹ Robbins, *The Aircraft Carrier Story*.

³⁰ David Hobbs, *British Aircraft Carriers, Design, Development and Service Histories* (Barnsley: Seaforth Publishing, 2013).

³¹ Hobbs, *Royal Navy's Air Service*.

like his predecessor in this regard, a certain predisposition towards the history of the aircraft carrier informs his narrative.³²

The RNAS and RAF conducted a number of carrier strike missions during the war, beginning with the Cuxhaven raid of 25 December 1914 and including other watershed events such as the planning for the Wilhelmshaven strike late in 1917 and the Tondern raid of 19 July 1918. The Cuxhaven raid occupies a bare two pages in the official history by Julian Corbett,³³ and only four pages in the first volume of *The War In The Air* by Walter Raleigh.³⁴ Peter Kemp discussed the raid in three pages,³⁵ as did Hugh Popham in four.³⁶ Roskill included the report of Lieutenant Frederick W. Bowhill, who was then the commander of HMS *Empress*, one the raiding seaplane carriers, in his documentary collection.³⁷ Pulsipher, in his 1981 PhD thesis, recognized the significance of the Cuxhaven raid, describing the Second World War aerial torpedo strikes at Taranto and Pearl Harbor as the ‘distant descendants of this Christmas Day [1914] raid’.³⁸ The raid has appeared briefly in a number of general histories, with authors often observing the raid’s significance as the first major carrier strike in history, in addition to being the first occasion in which aircraft attacked a ship at sea, in this case, Zeppelin *L6*’s attempt to bomb the departing squadron.³⁹ It is worth noting that strictly speaking the first seaplane carrier raid of the war had been carried out by the Imperial Japanese Navy’s *Wakamiya*, when two of its seaplanes attempted to bomb German fortifications at Tsingtao on 5 September 1914.⁴⁰

Despite its historic significance little was written on Cuxhaven until Richard Layman produced a detailed monograph in 1985. Layman reached the same conclusions as Pulsipher, but with opposite implications. According to Layman, Taranto was more a demonstration of how far fleet naval aviation had fallen since the end of the war. When compared to the commitment of

³² Pulsipher, ‘Aircraft and the Royal Navy’, pp. 188-283. Hobbs, *Royal Navy’s Air Service*, pp. 209-38, 278-343, 402-13, 429-76.

³³ Julian Corbett, *Naval Operations*, vol. II (Uckfield: The Naval & Military Press Ltd., 1921), pp. 51-2.

³⁴ Raleigh, *The War In The Air*, pp. 402-5.

³⁵ Kemp, *Fleet Air Arm*, pp. 31-3.

³⁶ Hugh Popham, *Into Wind* (Bath: Hamish Hamilton Ltd., 1969), pp. 22-5.

³⁷ Report by Lieutenant F. W. Bowhill, Commanding HMS *Empress*, on the Raid on Cuxhaven on Christmas Day 1914, AIR 1/167, #58 in Roskill, *Documents*, pp. 186-8.

³⁸ Pulsipher, ‘Aircraft and the Royal Navy’, pp. 150-1.

³⁹ Richard Layman, *The Cuxhaven Raid: The World’s First Carrier Air Strike* (London: Conway Maritime Press, Ltd., 1985) & Alexander Swanston and Malcolm Swanston, *Atlas of Air Warfare* (Heatherton Victoria: Hinkler Books Pty Ltd., 2009), p. 29.

⁴⁰ Mark Peattie, *Sunburst, The Rise of Japanese Naval Air Power, 1909-1941*, ebook (Annapolis: Naval Institute Press, 2001), loc. 517.

1914, the raid against the Italian fleet base in 1940 represented ‘a tragic display of numerical and technical weakness’.⁴¹ In his subsequent volume on naval aviation in the First World War, Layman identified the Cuxhaven raid as forming the archetypal North Sea aircraft carrier operation: hit-and-run strikes carried out by seaplanes supported by the Grand Fleet and Harwich Force.⁴² Robert Massie, in his modern operational survey of the war at sea, included a chapter on the Cuxhaven raid where he credited the plan in part to Churchill but specifically to Commodore (S) Roger Keyes and Commodore Reginald Tyrwhitt, an early example of air minded thought by the First Lord and the naval authorities at Harwich, something unmentioned in Keyes’ biography and for which no credit is given in the first volume of his Navy Records Society papers.⁴³ Layman, citing Keyes’ autobiography and Temple Patterson’s biography of Tyrwhitt, credited Tyrwhitt with the operational orders while attributing the origins of the plan itself to a conference between him, Churchill, First Sea Lord Prince Louis of Battenberg, and Vice-Admiral Doveton Sturdee, the Chief of the War Staff, which had been held on 22 October at the Admiralty (see Chapter Three).⁴⁴ The involvement of Keyes and Tyrwhitt in the planning process was echoed by Ian Gardiner in his chapter on Cuxhaven in his monograph on the Zeppelin shed strikes of 1914.⁴⁵

The role of Flight Commander F. E. T. Hewlett, one of the attacking seaplane pilots in the Cuxhaven raid, was specifically examined by Michael Goodall in a brief *Cross & Cockade* article published in 1975. Goodall reproduced the orders actually issued to the pilots as well as Hewlett’s report on the operation.⁴⁶ Frederick Bowhill’s career, including the Cuxhaven raid, was similarly surveyed by Alan Smith in a 1994 *Cross & Cockade* article, wherein Smith accepted Churchill’s claim to have created the plan, based on Churchill having taken credit for it

⁴¹ Layman, *The Cuxhaven Raid*, p. 142.

⁴² Layman, *Naval Aviation*, p. 102.

⁴³ Robert Massie, *Castles of Steel: Britain, Germany, and the Winning of the Great War at Sea* (New York: Ballantine Books, 2003), pp. 365-6. Paul G. Halpern, ed., *The Keyes Papers: Selections from the Private and Official Correspondence of Admiral of the Fleet Baron Keyes of Zeebrugge*, vol. I (London: Navy Records Society, 1972), pp. 57n, 64.

⁴⁴ Layman, *The Cuxhaven Raid*, pp. 36, 45. Hobbs, *Royal Navy’s Air Service*, p. 80. See also, Roger Keyes, *The Naval Memoirs of Admiral of the Fleet Sir Roger Keyes*, 2 vols. (London: Thornton Butterworth, 1934) & A. Temple Patterson, *Tyrwhitt of the Harwich Force: The Life of the Admiral of the Fleet, Sir Reginald Tyrwhitt* (London: Macdonald & Jane’s, 1973).

⁴⁵ Ian Gardiner, *The Flatpack Bombers: The Royal Navy and the ‘Zeppelin Menace,’* Kindle ebook (Barnsley: Pen & Sword Military, 2009), Chapter 5: Cuxhaven – The First Carrier Strike, loc. 2033.

⁴⁶ Michael Goodall, ‘F E T Hewlett and the Cuxhaven Raid,’ *Cross & Cockade International Journal* [CCIJ], vol. 6, no. 2 (Summer 1975), pp. 70–72. See also, Halpern, *The Keyes Papers*.

in the first volume of *The World Crisis*.⁴⁷ Colin Grey, the pre-war editor of *The Aeroplane* and *Jane's All the World's Aircraft*,⁴⁸ included two accounts of the operation in his 1941 and 1942 publications, concluding in the first that a failure of intelligence was the cause of the meager results, less than any technical limitations of the machines available at the time, and in the second that the small carriers had proven themselves - a lesson that he argues was forgotten in the rush to build fleet carriers during the interwar period.⁴⁹ Brad King more recently sounded a cautionary note, reminding researchers that the RNAS raiders failed to bomb the sheds (which were actually located at Nordholz) despite the raid's audacity.⁵⁰ Eric Grove argued that the raid was 'a precursor of a revolution in maritime warfare [yet] to come', more than an operation of any inherent military significance itself.⁵¹

The second major event in terms of aircraft carrier strike is the case of the High Seas Fleet strike plan, which has deservedly received renewed treatment in recently. Intended to be carried out late in 1917 by torpedo airplanes launched from converted merchant this was the most ambitious aerial project of the naval war. Its early demise is representative not only of the high expectations held for the RNAS fleet role, but also of the material limitations of the time. According to Jellicoe, as related in his book *The Grand Fleet*, aircraft flights directly from carrier decks had become viable during 1917,⁵² and this now made possible the use of airplane torpedo-bombers in the naval strike role. Admiral Beatty, after December 1916 the C-in-C Grand Fleet, in an attempt to resolve the dilemma resulting from the combination of potentially catastrophic submarine attacks on merchant ships (see Chapter Four), and the High Seas Fleet's unsporting desire not to be annihilated in a second Trafalgar, continued to press the Admiralty to consider an airplane torpedo attack against the Wilhelmshaven fleet base, hoping to dramatically

⁴⁷ Alan Smith, 'From Sail to Wing: The Career of Air Chief Marshal Sir Frederick Bowhill,' *CCIJ*, vol. 25, no. 1 (Spring 1994), p. 6. See also, Winston Churchill, *The World Crisis: Part I, 1911-1914*, ebook, vol. I (New York: RosettaBooks, LLC, 2013, originally published 1923), p. 360.

⁴⁸ Anthony Cumming, *The Battle for Britain: Interservice Rivalry between the Royal Air Force and Royal Navy, 1909-40*, Kindle ebook (Annapolis: Naval Institute Press, 2015), Chapter 3, loc. 1383-1400.

⁴⁹ Charles Grey, *Bombers* (London: Faber & Faber Ltd., 1941), p. 20. Charles Grey, *Sea-Flyers* (London: Faber & Faber Ltd., 1942), p. 88.

⁵⁰ Brad King, *Royal Naval Air Service, 1912-1918* (Aldershot: Hikoki Publications, 1997), p. 28.

⁵¹ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 31.

⁵² John Jellicoe, *The Grand Fleet 1914-1916: Its Creation, Development and Work*, Kindle ebook (London: Not So Noble Books, 1919), p. 72.

impact the course of the war through an attack on the enemy's fleet in harbour. Beatty fruitlessly endorsed this operation through the winter of 1917 and into the spring of 1918.⁵³

Arthur Marder was content to reflect that only a more aggressive and sustained development of fleet aircraft and aircraft carriers earlier in the war could have made these plans viable, and that the Admiralty had, prior to 1917, no reason to think that aircraft represented, 'a means of influencing effectively the war at sea.'⁵⁴ Despite this, Jellicoe and Beatty had requested that the Plans Division of the Naval Staff consider the possibility of aerial torpedo attack against both German and Austrian fleet bases but it was clear that the scale of the operation was too ambitious for realization, at least until late in 1918.⁵⁵ Richard Layman pointed out this reality, that the 'bold, ambitious, imaginative and prescient plan', was not likely to come off, citing John Bullen's 1987 article on the subject.⁵⁶ The explanation for the stillborn nature of the mission can be found in the diversity of operations the RNAS was conducting in 1917, notably the vast A/S campaign (see Chapter Four) as well as the ongoing air defence of Britain (see Chapter Six) in addition to supporting the RFC's continental long-range bombing program as part of the 41st Wing (see Chapter Five). David Hobbs, specialist in aircraft carrier history, has produced several examinations of the First World War Taranto that never was, emphasizing that the mission was not as illusory as it may at first have appeared.⁵⁷ Indeed, the Sopwith T1 torpedo-bomber, known after the war as the Cuckoo, had been first delivered to the RNAS torpedo school at East Fortune in September 1917,⁵⁸ and was actually deployed aboard HMS *Argus* in October 1918, as recalled by Squadron Commander Richard Bell Davies.⁵⁹ The slow development and delivery of the torpedo-bombers, however, meant the High Seas Fleet strike was only practicable very late in

⁵³ Arthur Marder, *From the Dreadnought to Scapa Flow [FDSF]*, vol. V (Annapolis: Naval Institute Press, 2014), p. 142.

⁵⁴ Marder, *FDSF*, vol. V, p. 303.

⁵⁵ Nicholas Black, *The British Naval Staff In The First World War* (Rochester: Boydell & Brewer Inc., 2011), p. 210.

⁵⁶ Layman, *Naval Aviation*, p. 192. See, John Bullen, 'The Royal Navy and Air Power: The Projected Torpedo-Bomber Attack on the High Seas Fleet at Wilhemshaven in 1918,' *Imperial War Museum Review*, vol. 2 (1987).

⁵⁷ Hobbs, 'The First Pearl Harbor: The Attack by British Torpedo Planes on the German High Seas Fleet Planned for 1918' in Antony Preston, John Jordan, and Stephen Dent (eds.), *Warship 2007*, Revised Edition (US Naval Institute Press, 2007).

⁵⁸ Grant Newman, 'Pioneering Torpedo Training at East Fortune 1918,' *CCLJ*, vol. 36, no. 3 (Autumn 2005), pp. 143–52.

⁵⁹ Keith McBride, "'The Hatbox': HMS *Argus*," in *Warship 1994*, ed. John Roberts (London: Conway Maritime Press, 1994), p.78. Richard Bell Davies, *Sailor in the Air: The Memoirs of the World's First Carrier Pilot* (Barnsley: Seaforth Publishing, 2008), p. 180.

the war. The operation would certainly have been possible by 1919, and by the armistice at least 90 torpedo-bombers had been delivered.⁶⁰

Gunfire Spotting, the Dardanelles, German East Africa

Reconnaissance, whether with the fleet or during anti-Zeppelin and A/S patrol, was the basic function of naval aviation in the First World War. A secondary role that emerged from aerial reconnaissance was the direction of gunfire against enemy positions during naval bombardment. There are two significant examples of aerial gunfire spotting during the 1914-1915 phase of the naval war, both associated with a significant body of literature. First, the gunfire spotting mission at the Dardanelles, and second, the mission to destroy the Imperial German Navy's light cruiser *Königsberg* in the Rufiji river delta, German East Africa (modern Tanzania).⁶¹ Although the RNAS role in the Dardanelles mission is extensively documented, there is less written about the Rufiji operation, where the researcher must rely to a greater extent on the archival material.

An essential component of the Dardanelles mission is the role played by HMS *Ark Royal* under Commander Robert Clark-Hall.⁶² Also important is the account of Wing Commander Charles Samson, who arrived at Imbros in March 1915 with No. 3 Wing, tasked with expanding the RNAS presence in theatre.⁶³ The inability of the Allied fleet to defeat the Dardanelles fortifications in the April – May phase of the fighting has in part been linked to the failure of aerial gunfire spotting, a not entirely surprising outcome considering that only *Ark Royal* was present during the initial phase of operations, and furthermore that the method of spotting had to be created from scratch by the naval practitioners on the spot.⁶⁴

Marder in this regard singled out the lack of doctrine related to the employment of naval aircraft for gunnery spotting.⁶⁵ Marder's conclusions were influenced by correspondence with RAF Group Captain (in 1915, Lieutenant-Commander, RN) Hugh Williamson, one of the key RNAS practitioners and an observer aboard *Ark Royal*.⁶⁶ Marder reproduced some of

⁶⁰ Hobbs, *Royal Navy's Air Service*, p. 459.

⁶¹ Terry Treadwell, *The First Naval Air War* (Stroud: The History Press, Ltd, 2010), pp. 14-21. King, *Royal Naval Air Service*, pp. 49-52.

⁶² R. H. Clark-Hall and J. L. Clark-Hall, *Air Marshal Sir Robert Clark-Hall, K.B.E. C.M.G. D.S.O.* (Christchurch: The Raven Press Co. Ltd., 1995), pp. 57-80.

⁶³ Charles Samson, *Fights and Flights* (Nashville: The Battery Press, 1930), pp. 215-88.

⁶⁴ Christopher Bell, *Churchill And The Dardanelles* (Oxford University Press, 2017), pp. 94-5.

⁶⁵ Arthur Marder, *From the Dardanelles to Oran: Studies of the Royal Navy in War and Peace, 1915-1940* (Barnsley: Seaforth Publishing, 2015), p. 11.

⁶⁶ *Ibid*, p. 6fn.

Williamson's correspondence in his 'Dardanelles Revisited,' chapter.⁶⁷ Marder criticized the Naval Staff, who he blamed along Roskill's lines for an 'obsession with the big-gun duel' and therefore a failure to develop aerial spotting doctrine to an efficient level prior to 1915.⁶⁸

Corbett, in the official naval history, dismissed the seaplane spotting efforts at the Dardanelles as 'not too efficient'.⁶⁹ Eric Grove agreed that the Dardanelles campaign highlighted the lack of 'experience and doctrine spotting for guns'.⁷⁰ Nevertheless, the importance of aircraft for amphibious operations had been demonstrated, and by 1922 was recognized, based on the 1915 role, as an essential component in any future amphibious operations.⁷¹

In the case of the Ruffiji delta, Flight Commander J. T. Cull provided the initial aerial response while RNAS assets in theatre were steadily reinforced to provide consistent aerial gunfire spotting.⁷² Corbett observed the significance of the environmental factor, the RNAS not only had to develop its gunfire spotting methods on the spot, but the seaplanes themselves were vulnerable to degradation, the result of tropical climate.⁷³ After the culmination of the operation on 6 July 1915, when aerial gunfire spotting produced several significant hits against *Königsberg*, the RNAS mission was redirected into an unconventional war, ranging into Rhodesia and elsewhere.⁷⁴ What is significant about the *Königsberg* case, and the Dardanelles mission, is that in both theatres the RNAS and Royal Navy practitioners were forced to develop tactical doctrine on the spot, indeed independent of each other, utilizing limited resources and, more often than not, technically deficient equipment.

The Battle of Jutland, The Flying Squadron and the Tondern Raid

The RNAS involvement in the Battle of Jutland looms large in the historiography as a missed opportunity: an indication that the Air Department's many avenues of development not yet

⁶⁷ Ibid, pp. 1-32. Arthur Marder, 'The Dardanelles Revisited: Further Thoughts on the Naval Prelude,' in *Dreadnought to Polaris: Maritime Strategy since Mahan*, ed. A. M. J Hyatt (Vancouver: The Copp Clark Publishing Company, 1973), pp. 30-47.

⁶⁸ Marder, *From the Dardanelles to Oran*, p. 11.

⁶⁹ Corbett, *Naval Operations*, vol. II, pp. 187, 208.

⁷⁰ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?' p. 33.

⁷¹ Richard Harding, 'The Long Shadow of the Dardanelles on Amphibious Warfare in the Royal Navy,' in *Dreadnought to Daring*, p. 89. See also, W. A. B. Douglas, 'The R.N.A.S. in Combined Operations 1914-1915,' in *Dreadnought to Polaris*, pp. 19-29.

⁷² Jones, *WIA*, vol. III, pp. 10-12. Popham, *Into Wind*, pp. 74-5. Hobbs, *Royal Navy's Air Service*, pp. 151-3.

⁷³ Corbett, *Naval Operations*, vol. III, pp. 65-6.

⁷⁴ Jones, *WIA*, vol. III, p. 19.

matured. There were two notable RNAS events at Jutland, both which have generated their share of controversy in the literature. First, the delayed sailing of Jellicoe's carrier HMS *Campania* and second, the brief but historic flight of Flight Lieutenant Rutland from HMS *Engadine*.

Jellicoe's Grand Fleet carrier *Campania* carried ten seaplanes on 31 May 1916, and despite having also been refitted with balloons for reconnaissance and spotting at the C-in-C's request, was ordered back to harbour when it was discovered that the ship had sailed alone, many hours after the fleet had already put to sea.⁷⁵ The story behind *Campania*'s delayed sortie has remained fairly consistent. Jones presented the outline of events in volume II of the *War in the Air*, and the essential facts are also reproduced by Corbett in volume III of *Naval Operations*, and again by Marder and then Massie.⁷⁶ Captain Oliver Schwann, a member of Sueter's staff before the war, was the commander of *Campania* on the fateful evening of 30 May. Schwann did not receive the critical stationing signal of 10:54 pm, which would have instructed *Campania* to move astern of the cruiser *Blanche*, and thus be the last ship to depart Scapa Flow.⁷⁷ As a result of this error, *Campania* did not actually leave Scapa until 1:15 am, and thus, although proceeding at a maximum speed of 20.5 knots, was sailing unescorted into what were likely to be submarine infested waters. At 4.37 am Jellicoe ordered the carrier back to base.⁷⁸ The result of this delay was that HMS *Engadine*, Vice-Admiral Beatty's seaplane carrier with the Battle Cruiser Fleet, was the only RNAS asset present with the fleet at the start of the battle.

Jones argued that by the time the Battle of Jutland was fought, with the exception of rigid airships, the RNAS had developed a significant fleet capacity including seaplanes, ship launched airplanes, and coastal (non-rigid) airships. The missing element was proficiency with fleet operations. The reports made by Flight Lieutenant Rutland, who flew the only RNAS sortie at Jutland, were not relayed to Beatty's flagship, HMS *Lion*. Rutland's story is told in almost every historical retelling of the Battle of Jutland, including in his biography by Desmond Young.⁷⁹ In

⁷⁵ Jones, *WIA*, vol. II, p. 406. See also Corbett, *Naval Operations*, vol. III, p. 326a&b

⁷⁶ Jones, *WIA*, vol. II, pp. 406-7. Corbett, *Naval Operations*, vol. III, p. 326. Marder, *FDSF*, vol. III, pp. 48-9. Massie, *Castles of Steel*, pp. 576-7.

⁷⁷ Ian Burns, *The RNAS and the Birth of the Aircraft Carrier, 1914-1918*, Kindle ebook (Oxford: Fonthill, 2014), Chapter 9, Jutland, loc. 1947.

⁷⁸ Burns, *The RNAS and the Birth of the Aircraft Carrier*, Chapter 9, Jutland, loc. 1993. Hobbs, *Royal Navy's Air Service*, pp. 182-3.

⁷⁹ Desmond Young, *Rutland of Jutland* (London: Cassell, 1963), pp. 3-9. See also, H. W. Fawcett and W. W. Hooper, eds., *The Fighting at Jutland* (Driffield: Oakpost Ltd, 2010), pp. 21-23. Andrew Gordon, *The Rules of the Game* (London: John Murray, 1996), p. 107. Nicholas Jellicoe, *Jutland: The Unfinished Battle* (Croydon: Seaforth Publishing, 2016), p. 109. John Campbell, *Jutland: An Analysis of the Fighting* (New York: Lyons Press, 1998),

agreement with Eric Grove, James Pugh noted that Rutland's single flight, and *Campania*'s non-presence, pointed to a clear 'inexperience of cooperation between aerial resources and the fleet.'⁸⁰

The final watershed in the historiography of aerial fleet operations is the Tondern raid, during which two of Germany's newest naval Zeppelins were destroyed in their sheds, not only eliminating the airships but also their expensive base facilities. This raid, carried out on 19 July 1918, has been considered the ultimate expression of the Royal Navy's fleet airpower during the First World War.⁸¹ The Flying Squadron of the Grand Fleet, the centralized aircraft carrier squadron under Admiral Commanding Aircraft (ACA) Rear-Admiral Richard Phillimore, was the offensive element, centered around the converted carrier HMS *Furious*, which could launch Sopwith Camels (the loss of Squadron Commander Edwin H. Dunning during his ultimately fatal effort to demonstrate landing capability aboard *Furious* has been memorialized in the historiography).⁸²

For his part, Rear-Admiral Phillimore's career has been the subject of only limited research, and the material available is in fact significant, although the history of the Flying Squadron is almost entirely based on diaries and archival documents. The most comprehensive source is the Phillimore family papers that provide biographical details on the family, as well as information about where and how the various Phillimore documents can be located and accessed in archives around Britain.⁸³ Phillimore is only one of the many RNAS practitioners whose important story has not been conclusively examined in the secondary literature (see Chapter Three).

Anti-Submarine Warfare and Convoy Protection

Routine ocean patrol consumed the majority of the attention from the RNAS squadrons operating along the coasts of the British Isles. In addition to oceanic patrol, RNAS aircraft and airships provided air cover for merchant ship convoys, which eventually became the crucial mission of

pp. 33, 35. John Brooks, *The Battle of Jutland* (Cambridge: Cambridge University Press, 2016), p. 177. Robbins, *The Aircraft Carrier Story*, pp. 34-5.

⁸⁰ Pugh, 'Conceptual Origins of the Control of the Air', p. 314. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 42.

⁸¹ Dick Cronin, 'Tondern: Prelude, Climax and Aftermath,' in *CCIJ*, vol. 25, no. 2 (Summer 1994), pp. 57-68.

⁸² Wragg, *A Century of British Naval Aviation*, p. 26.

⁸³ *The Phillimore Papers, 1798-1945: An Illustrated Guide to a Naval, Political, Country House, and Estate Archive* (Phillimore Family Trust, 1997). Phillimore's files are at the Imperial War Museum archive in London.

the RNAS during the war. Broadly the roles of the RNAS in the A/S campaign involved patrols and contact sorties, submarine base bombing carried out by the Dunkirk forces, and convoy escort, both of merchants and warships. While the initial mission of the RNAS was reconnaissance - overflying the North Sea, English Channel, Atlantic approaches - as the submarine crisis deepened the RNAS became more significantly involved in offensive activities.

Having been appointed First Sea Lord in December 1916 the defeat of the German U-boats became Admiral Jellicoe's foremost priority. The RNAS played its part alongside the numerous reforms implemented by Jellicoe and his Director Anti-Submarine Division (ASD) of the Naval Staff, Rear-Admiral Alexander Duff. The technological improvements of 1915-1916 had produced the machinery and tactics needed to hunt and destroy the U-boats at sea, and it would soon be possible to systematically bomb their bases in occupied Belgium. Convoys, beginning in May 1917, in conjunction with the airplane 'spider web' patrols,⁸⁴ and other techniques, significantly diminished the submarine threat (see Chapter Four). Although hardly half a dozen of the 178 German submarines lost during the war had been destroyed by aircraft or with airship and aircraft support in some fashion, aircraft had nevertheless become a cornerstone of the Royal Navy's A/S strategy, far more important than is traditionally recognized.⁸⁵

The early theoretical material on the subject is significant, demonstrating that the use of aircraft against submarines had been a concept in development since the formation of the RFC and its Naval Wing. The use of aircraft in the A/S campaign changed during the course of the war as shifting priorities produced different approaches to ASW, with the RNAS eventually providing tailored air support to each regional naval command. In a similar vein, events in the Mediterranean are often mentioned only in passing, or ignored all-together, in comparison to the more frequently discussed North Sea and Atlantic conflicts. Almost completely missing from the historiography is analysis of the Naval Staff's Air Division - the Admiralty's response to the creation of the Air Ministry in January 1918 - that produced a number of manuals and references meant to train RAF pilots in the difficult subject of aerial ASW and convoy escort.

The literature on the submarine war is immense and includes several official histories, such as those of Britain's merchant marine and seaborne trade, not to mention the final two

⁸⁴ Theodore Douglas Hallam, *The Spider Web* (Drifffield: Leonaur, 2009).

⁸⁵ Abbatiello, 'The Myths and Realities of Air Anti-Submarine Warfare during the Great War,' in *Air Power Review*, vol. 12, no. 1 (2009), p. 15.

volumes of *Naval Operations* by Corbett's successor, Henry Newbolt.⁸⁶ There are a number of essential secondary texts in addition to key sources produced by the practitioners themselves. The literature on RNAS ASW contains memoirs, the pertinent sections of the official histories, as well as subsequent general and specialized texts. The submarine war fought by the RNAS intersects with the historiography on the submarine crisis itself, which represents a significant portion of the history of the war at sea.⁸⁷ The literature, in general, has tended to emphasize the contribution of naval aviation to patrol and escort missions, while the direct impact of air attacks against submarines has been overlooked.

Amidst this cornucopia of literature, the most comprehensive modern sources specifically focused on the RNAS in its A/S role are John Abbatiello's thesis and monograph. Abbatiello's 2004 King's College London thesis 'British Naval Aviation and the Anti-Submarine Campaign, 1917-18' was published in 2006 as *Anti-Submarine Warfare in World War I*, and both volumes address at length the RNAS contribution to convoy escort and A/S missions. Abbatiello's thorough examination of the archival documents and his reconstruction of the Admiralty's district and convoy A/S system represent a milestone in the historiography of the RNAS. Airships and airplanes provided coverage for convoys, of which Abbatiello identified four distinct types: convoys from Britain to the Allies; convoys as warship escort - including the Grand Fleet - convoy of overseas trade; and convoy along the coasts of the United Kingdom (see Chapter Four).⁸⁸ Abbatiello utilized Marder, Williamson, and the many reports and manuals produced by the Air Department and Air Division concerning aerial ASW, to conclude that in fact the RNAS had been highly successful at ASW during the conflict, but only as a component of the broader Royal Navy effort.⁸⁹ Abbatiello's work is also useful for its detailed analysis of the Dunkirk wing's bombing programme (see Chapter Five).

The introduction of convoys during the unrestricted U-boat campaign midway through 1917 has traditionally been perceived as a controversial event in the literature, and the involvement of the RNAS in convoy protection has tended to obscure the significant

⁸⁶ Archibald Hurd, *The Merchant Navy*, 3 vols. (London: John Murray, 1921), & Charles Ernest Fayle, *Seaborne Trade*, 3 vols. (London: John Murray, 1920-4). Henry Newbolt, *Naval Operations*, vol. IV & V (Eastbourne: The Naval & Military Press Ltd., 1928-31).

⁸⁷ John Jellicoe, *The Submarine Peril* (London: Cassell & Co. Ltd., 1934). Jellicoe, *The Crisis of the Naval War* (London: Cassell and Company, Ltd, 1920). R. H. Gibson and Maurice Prendergast, *The German Submarine War, 1914-1918*, Revised edition (London: Naval & Military Press, 2003).

⁸⁸ Abbatiello, *Anti-Submarine Warfare*, pp. 109-11.

⁸⁹ *Ibid*, p. 108.

achievements of the RNAS in the more mundane aerial patrol and submarine hunting roles. Memoirs of the flying boat and non-rigid airship pilots who conducted the famous ‘spider web’ patrols are at the forefront of the historiography, creating an individualized - worm’s eye - perspective that, although invaluable as egodocuments, are not reflective of the totality of the Air Department’s efforts. Furthermore, due to the relatively limited involvement of the RNAS in ASW prior to 1917 the literature disproportionately favours 1917 and 1918 at the expense of the period 1914-1916.

The War Zone, and the Development of Non-Rigid Airships

The first phase of unrestricted submarine warfare saw the RNAS pressed to its organisational limits. In 1915 the RNAS was not only fighting at the Dardanelles, but also conducting the air defence of Britain, carrying out routine North Sea coastal patrols, attacking raiding Zeppelins, to which was added an increasing responsibility for the A/S campaign.⁹⁰ Rapid technological and operational changes employed by the U-boat commanders soon changed the focus of operations to the North Atlantic, beyond the perimeter of Allied naval defence.⁹¹

The second volume of *The War in The Air* discussed naval aviation in the first phase of the A/S campaign. Jones suggested that although it was generally agreed that airplanes would play a significant role in ASW, it was not until 1916 that serious efforts at integration began.⁹² The 1916 efforts are described in Jones’ volume V, including the work of Rear-Admiral Mark Kerr, commander British Adriatic Squadron.⁹³ Jones related that Kerr provided three elements for aircraft’s involvement in the A/S campaign in the Mediterranean: patrol of the Straits of Otranto, attack of the Austrian submarine facilities at Pola, and bombing of the torpedo facilities believed to be at Fiume.⁹⁴ This is representative not only of the diversity of the RNAS contribution to ASW but also of its geographical breadth; similar bombing operations were underway from RNAS Dunkirk.

Roskill criticized Jellicoe and Duff for their initial opposition to the implementation of convoy, which he identified as related to Jellicoe’s apparent hesitation to draw destroyers away

⁹⁰ Kemp, *Fleet Air Arm*, p. 34.

⁹¹ Corbett, *Naval Operations*, vol. II, pp. 386, 392.

⁹² Jones, *WIA*, vol. II, pp. 392-3.

⁹³ Kerr later became Deputy Chief of the Air Staff: Jones, *WIA*, vol. V, p. 388.

⁹⁴ Jones, *WIA*, vol. V, pp. 388-9. Layman, *Naval Aviation*, p. 84.

from the Grand Fleet.⁹⁵ Indeed, the Navy's unpreparedness for ASW was problematic considering that Williamson had, as early as 1912 (then as a Lieutenant), submitted a paper to the Admiralty describing the basics of aerial ASW.⁹⁶ Roskill was not alone in his criticism of Jellicoe's handling of the submarine threat. Nicholas Rodger likewise targeted Jellicoe for his opposition to the Naval Staff and the convoy system alike.⁹⁷ On the other hand, Abbatiello observed that Jellicoe and Beatty had been instrumental in pressing for the purchase of Large America flying boats, vitally useful in 1917 (see Chapter Four), combined with additional RNAS station construction to expand the air patrols already taking place.⁹⁸ Nicholas Black, citing Abbatiello's PhD thesis, discussed the A/S policy adopted by Jellicoe: a combined arms approach using destroyer and air patrols, initially in the form of kite-balloons, to seek out the submarines.⁹⁹ Black concluded that the roles envisioned for aircraft in terms of A/S patrols, scouting and bombing were, as late as 1917-18, far in advance of the technical capabilities of the aircraft themselves.¹⁰⁰

Non-rigid airship development played a very significant role in the history of the Royal Navy's A/S system. It is also a subject specifically treated in the literature. Arthur Eveleigh-de-Moleyns, the Baron Ventry, one of the authors of *Jane's Pocket Book of Airship Development*, was himself a longstanding advocate of blimp development, even after the Second World War,¹⁰¹ as testified to by his article in the 1958 *Naval Review*.¹⁰² As with all areas of First World War history, the 21st century saw a flurry of renewed interest and specialist publications on the subject of British airship development in the A/S role. Guy Warner's life of Lt. Commander N. F. Usborne,¹⁰³ the noted non-rigid airship constructor who, together with Squadron Commander de Courcy Ireland of Great Yarmouth NAS, was killed on 21 February 1916,¹⁰⁴ is one such text. Warner's history provides a modern examination of the unique role played by the non-rigid

⁹⁵ Roskill, *Churchill and the Admirals*, p. 67.

⁹⁶ Goulter, *A Forgotten Offensive*, p. 2. Layman, *Naval Aviation*, p. 79. The paper is entitled 'The Aeroplane in Use Against Submarines' and is held in Group Captain Hugh Williamson Papers at Churchill College, Cambridge (CCC), WLMN.

⁹⁷ Rodger, *The Admiralty*, p. 133.

⁹⁸ Abbatiello, *Anti-Submarine Warfare*, pp. 88, 93.

⁹⁹ Black, *The British Naval Staff*, pp. 207-9.

¹⁰⁰ *Ibid*, p. 209.

¹⁰¹ Lord Ventry and Eugene Kolesnik, *Jane's Pocket Book of Airship Development* (The Book Service Ltd., 1976).

¹⁰² Lord Ventry, 'British Naval Non-Rigid Airships, 1914-1918,' in *NRJ*, vol. 46, no. 1 (January 1958), pp. 26-33.

¹⁰³ Guy Warner, *Lighter Than Air: The Life and Times of Wing Commander N. F. Usborne RN*, Kindle ebook (Barnsley: Pen & Sword Aviation, 2016).

¹⁰⁴ David Wragg, *Wings Over The Sea, A History of Naval Aviation* (New York: Arco Publishing, Inc., 1979), p. 29.

airship in the A/S campaign, in particular during 1915 and 1916. Another modern text of inestimable value is Brian Turpin's documentary collection,¹⁰⁵ specifically focused on the RNAS airships and ASW. Turpin's collection contains many excerpts from letters and memorandum written by Britain's pioneering non-rigid airships designers and pilots. Turpin had previously published an article on the subject for *Cross & Cockade* in 1984.¹⁰⁶

Specifically missing from these otherwise excellent sources is a biography of Wing Captain Edward Maitland. Maitland became the senior chief of the Air Department's Airship Section in July 1917,¹⁰⁷ and was responsible for naval airship developments after the creation of the RAF. Also missing is a biographical study of Wing Captain Charles Lambe, or a history of Dunkirk NAS itself. Like Wing Captain Elder of No. 3 Wing (Luxeuil) and Rear-Admiral Phillimore of the Flying Squadron, Lambe's essential role, and the story of his administration over one of the most important naval air stations of the war, has inexplicably remained overlooked. As with the other two officers mentioned, the researcher must turn to the archives for details of Lambe's RNAS career.¹⁰⁸

Jellicoe at the Admiralty and Reforming the Air Department

Admiral Jellicoe provided four pages specifically on 'Aircraft for Anti-Submarine Work' in *The Crisis of the Naval War*.¹⁰⁹ Jellicoe observed that by the summer of 1917 the newly integrated A/S system was indeed producing results.¹¹⁰ This contrasted with the situation in 1916, a time when the fleet was, in Jellicoe's assessment, 'ill provided with aircraft' of sufficient range and payload for A/S missions.¹¹¹ This was essentially a problem of technological limitations. Powerful seaplanes such as the Curtiss flying boats, that had the potential to intercept surfaced submarines, were not available until early 1917.¹¹² There is a significant quantity of literature specifically focused on the flying boats and ASW, and, considering that the United States Navy

¹⁰⁵ Brian Turpin, *Coastal Patrol: Royal Navy Airship Operations During the Great War 1914-1918*, Kindle ebook (Oxford: Fonthill Media Limited, 2016).

¹⁰⁶ Brian Turpin, 'Coastal Patrol Airships, 1915-1918,' in *CCIJ*, vol. 15, no. 2 (Summer 1984), pp. 63-71.

¹⁰⁷ Dennis Richards, 'Maitland, Edward Maitland (1880-1921), Air Force Officer and Developer of Airships and Parachutes,' in *Oxford Dictionary of National Biography* [ODNB] (Oxford University Press, 2004).

¹⁰⁸ See Dunkirk, Commodore Records, No. 11, ADM 137/2278, as well as AIR 1/640 & AIR 1/672, containing orders and reports by Wing Captain Lambe while head of RNAS Dover-Dunkirk

¹⁰⁹ Jellicoe, *The Crisis of the Naval War*, p. 70.

¹¹⁰ Ibid, p. 71.

¹¹¹ Ibid, p. 70.

¹¹² Hobbs, *Royal Navy's Air Service*, p. 247. Hallam, *The Spider Web*, pp. 23-4.

(USN) was responsible for A/S patrols over the Atlantic approaches late in 1917 and during 1918, this includes some titles by American practitioners and historians.¹¹³

Skeptics were critical of the RNAS contribution. Alfred Price for example noted errors in the official tally of enemy submarines destroyed from the air and concluded that '[t]he aircraft was far more effective in preventing attack... than in hunting the submarines moving to and from their operational areas.'¹¹⁴ Abbatiello's research in fact suggested the opposite, that hunting patrols had been more useful than historians had hitherto imagined, and that the regional command system implemented by Jellicoe and adopted by the RNAS had created a tailored approach that effectively contributed to the defeat of the U-boat threat during the war.¹¹⁵

Geographically, the literature has benefitted from a number of books on the RNAS bases themselves, which were essential for coastal patrol and submarine hunting. Indeed, the narrative from the RNAS bases has too often been overlooked. The classic 1928 account of Great Yarmouth by Charles Gamble,¹¹⁶ and the account of Felixstowe under Squadron Commander John Porte, by Hallam,¹¹⁷ shaped the terrain. More recent publications have contributed to this legacy. Gordon Kinsey produced two volumes, one on Felixstowe,¹¹⁸ and another on Pulham (the site of an RNAS Coastal-type non-rigid airship base).¹¹⁹ Even more recently, Kent,¹²⁰ Westgate,¹²¹ Cornwall,¹²² Kingsnorth,¹²³ Ulster,¹²⁴ and even the Isles of Scilly,¹²⁵ have all been the subject of this geographic treatment, recognition of the immensity of the A/S project.

¹¹³ Geoffrey Rossano, *Stalking the U-Boat, U.S. Naval Aviation in Europe during World War I* (Gainesville: University Press of Florida, 2010). Irving Sheely, *Sailor of the Air*, ed. Lawrence Sheely (Tuscaloosa: University of Alabama Press, 1993).

¹¹⁴ Alfred Price, *Aircraft versus Submarines: The Evolution of the Anti-Submarine Aircraft 1912 to 1972* (London: William Kimber, 1973), p. 31.

¹¹⁵ Abbatiello, 'British Naval Aviation', p. 248.

¹¹⁶ Gamble, *The Story of a North Sea Air Station*.

¹¹⁷ Hallam, *The Spider Web*.

¹¹⁸ Gordon Kinsey, *Seaplanes - Felixstowe: The Story of the Air Station, 1913-1963* (Lavenham: Terrence Dalton, 1978).

¹¹⁹ Gordon Kinsey, *Pulham Pigs: The History of an Airship Station* (Lavenham: Terrence Dalton, 1988).

¹²⁰ Martin Easdown & Thomas Genth, *A Glint in the Sky: German Air Attacks on Folkestone, Dover, Ramsgate, Margate and Sheerness During the First World War* (Barnsley: Pen & Sword, 2004).

¹²¹ Geoffrey Williams, *Wings Over Westgate: The Story of a Front Line Naval Air Station During World War I* (Malling, Kent: Kent County Library, 1985).

¹²² Peter London, *U-Boat Hunters: Cornwall's Air War, 1916-1919* (Truro: Dyllansow Truran, 1999).

¹²³ Tina Bilbe, *Kingsnorth Airship Station: In Defence of the Nation*, Kindle ebook (Stroud, The History Press, 2014).

¹²⁴ Guy Warner, *Airships Over Ulster: Royal Naval Air Service Airships During the First World War* (Newtownards: Colourpoint Books, 2012).

¹²⁵ Richard Larn, *The Isles of Scilly in the Great War* (Barnsley: Pen & Sword Books, Ltd., 2017).

Specialized monographs on the coastal stations provide the essential link between the A/S campaign and the defence of England from aerial attack, connecting operational leadership, the SNOs and RNAS station commanders, with the tactical squadrons and senior administration at the Air Department and Admiralty.¹²⁶

Aerial A/S operations continued after the creation of the RAF, and the new RAF groups functioned essentially as they had when part of the RNAS. For example, air support for the Dover barrage continued under Wing Captain Lambe, although the RNAS force was now designated RAF No. 5 Group.¹²⁷ The RAF did introduce a shift in focus towards greater emphasis on the land battle on the Western Front, although routine A/S patrols continued to be flown.¹²⁸ In the appendix volume of *The War in The Air*, Jones provided the statistics of RAF Groups 9 (Plymouth), 10 (Portsmouth) and 18 (East Coast) between July and September 1918, with the figures demonstrating that 85 submarines were sighted and 48 attacks were made, indicative of the ongoing nature of the naval air war against the submarines.¹²⁹ Appendix XVII summarized the anti-submarine patrols between May and November 1918, and indicated that 167 submarines were sighted and 115 attacked, all told, an important improvement over previous years due in large measure to improved aircraft, weapons and tactics developed by the service practitioners.¹³⁰

Air Division of the Naval Staff and the Creation of the RAF

The Air Division of the Naval Staff, headed first by Wing Commander Scarlett and then RAF Brigadier-General Groves, is another of the still under-examined components of the Air Department's history. Strictly speaking the Air Division of the Naval Staff acted as the successor to the Air Department, the latter organization abolished upon the formation of the Army-modeled Air Council, 3 January 1918.¹³¹ Jellicoe, who had seen the writing on the wall regarding the fate of the Admiralty's Air Department, in one of his final acts as First Sea Lord and Chief of the

¹²⁶ Mike O'Connor, *Airfields & Airmen of the Channel Coast*, Kindle ebook (Barnsley: Pen & Sword Military, 2005), Philip MacDougall, *When The Navy Took To The Air: The Experimental Seaplane Stations of the Royal Naval Air Service* (Croydon: Fonthill Media, 2017), Easdown & Genth, *A Glimpse in the Sky*.

¹²⁷ Abbatiello, *Anti-Submarine Warfare*, p. 114.

¹²⁸ Goulter, *A Forgotten Offensive*, p. 21.

¹²⁹ Jones, *WIA*, Appendices, p. 88.

¹³⁰ Ibid, Appendix XVII.

¹³¹ Jones, *WIA*, vol. VI, p. 22. Richard Overy, *The Birth of the RAF*, Kindle ebook (London: Allen Lane, 2018), pp. 38-41.

Naval Staff (CNS), ordered the creation of the Air Division, officially formed on 14 January 1918 by his successor, Admiral Wemyss, four days before Major General Sir Hugh Trenchard became Chief of the Air Staff.¹³² Although the Air Department - along with its offices in the Hotel Cecil - were lost to the Air Ministry, the disruption caused to actual naval operations was minimized by the immediate creation of a successor organization under the auspices of the Naval Staff. Indeed the Air Division, like the Royal Navy's airship service, lived on despite the creation of the RAF on 1 April 1918, and acted as the liaison between the Admiralty and Air Ministry until 1919.¹³³ The records of the Air Division, although incomplete, exist in large measure as part of the Air Ministry files held at the National Archives, Kew.¹³⁴ Just as the Air Department has never been the subject of its own comprehensive history, no monograph length analysis of the Air Division exists, both omissions representative of the serious gaps in the literature.

Long-Range Bombing, Dunkirk, No. 3 Wing, and the 41st Wing RFC

Strategic bombing was the most controversial activity within the RNAS's wartime regime. Serious criticism has been raised against the Air Department for its involvement in industrial bombing, a subject treated in the literature as an improper use of naval aviation, a diversion that adversely impacted the development of the supposedly proper role of fleet aviation. A recent popular history of the FAA, for example, described the efforts of the Independent Force, to which the RNAS provided two squadrons of Handley Page bombers, as 'a waste of time' and detrimental to the evolution of naval air power.¹³⁵ Roskill introduced his *Documents* collection with the observation that the RNAS involvement with tasks other than fleet aviation led to the stunted development of 'anti-submarine work and attack on enemy warships at sea and in harbour.'¹³⁶ Roskill went on to argue that the reason these so-called 'true functions' of naval air power were undermined had to do with the failure of the post-Churchill-Fisher regimes at the Admiralty to appreciate naval aviation, in particular citing the distraction of the strategic

¹³² Hobbs, *The Royal Navy's Air Service*, p. 375. Memorandum by Captain G. P. W. Hope, Director of Operations Division, dated 19 December 1917, ADM 1/8508, #216 in Roskill, *Documents*, pp. 603-4.

¹³³ Abbatiello, *Anti-Submarine Warfare*, p. 93.

¹³⁴ See the Air Division files, AIR 1/273 to AIR 1/292.

¹³⁵ Wragg, *A Century of British Naval Aviation*, p. 22.

¹³⁶ Roskill, *Documents*, p. xv.

bombing campaign.¹³⁷ Roskill criticized long-range bombing, in particular, for resulting in the 'unhappy consequences' of the creation of the RAF.¹³⁸

The literature on this subject is divided, composed of texts examining the political and military origins of the RAF and its Independent Force, while only partially examining the history of the Royal Navy and its involvement with long-range bombing. The RNAS contribution forms three distinct elements in the literature. First, the initial bombing efforts endorsed by Churchill, primarily focused against Germany's Zeppelin sheds and factories within range of the RNAS aircraft during 1914. Second, bombing operations carried out against submarine bases along the Belgian coast from the RNAS base at Dunkirk, and, third, the development of RNAS No. 3 (Luxeuil) Wing that carried out long-range bombing missions against German industrial targets between October 1916 and May 1917. Surprisingly, no single study exists specifically focused on the efforts of No. 3 Wing. Slightly better represented in the historiography is the RNAS role within the 41st Wing of the RFC, formed in October 1917 in response to Germany's Gotha bombing campaign. The early history of the RAF represents most of the historical material on this subject, leaving the Navy's contribution generally under-examined.

As the literature on the subject invariably engages with the controversy of strategic bombing as perceived from the post-Second World War perspective, the limited results of the Navy's efforts in 1916 and 1917 are believed to have been so minute as to have been insignificant. Robert Grattan stated that 'the results gained in the First World War did not justify the exaggerated claims' of the strategic bombing enthusiasts.¹³⁹ On the other hand, Jones stated that 'it is clear that the [morale] effect produced by the naval bombing wing was disproportionate to the number of raids'.¹⁴⁰ The researcher must carefully judge for his or herself what was the real impact of the Navy's long-range bombing.

Anti-Zeppelin Shed Raids in 1914, RNAS Dunkirk & No. 3 Wing, Luxeuil

The Zeppelin shed raids, often associated with the literature on the Zeppelin raids against Britain (see Chapters Five and Six), are widely recognized as the first truly long-range bombing

¹³⁷ Ibid, pp. xvi-ii, 453.

¹³⁸ Ibid, p. 166.

¹³⁹ Robert Grattan, *The Origins of Air War* (New York: I. B. Tauris, 2009), p. 139.

¹⁴⁰ Jones, *WIA*, vol. VI, p. 122.

operations in history.¹⁴¹ The Navy's pioneering of long-range bombing may seem counterintuitive, but as Raleigh observed of the Navy's traditional role 'our frontiers are the enemy coasts'.¹⁴² Specialized histories have appeared in recent years, such as Ian Gardiner's monograph on the Zeppelin shed raids, including chapters on each major raid.¹⁴³ Grattan described Churchill's 1914 policy of attacking Zeppelin sheds as an early example of an offensive 'counter air' doctrine.¹⁴⁴ Jones credited the aggressive base-bombing policy as having contributed to the rapid expansion of aircraft technology early in the war,¹⁴⁵ an assessment shared by Lee Kennett who pointed to the example of the Handley Page bomber, the development of which was overseen by DAD Commodore Sueter.¹⁴⁶ Rob Langham in his general history of the Handley Page bombers likewise observed that Churchill had first authorized their development in December of 1914, in anticipation of expanded operations to come, with a further four prototype aircraft ordered in February 1915.¹⁴⁷

The development of naval bombing from RNAS Dunkirk is another of the controversial cases in the Air Department's history. Wing Captain Lambe, a strong proponent of the development of the Navy's aerial bombing capability, was intent on bombing Germany's submarine bases along the occupied Belgian coast, in addition to bombing military and air targets behind the frontlines. Lambe's efforts were repeatedly frustrated by his SNO Vice-Admiral Reginald Bacon, who commanded the Navy's Dover Patrol. Bacon was eventually replaced with Vice-Admiral Keyes, who released Lambe to carry out his bombing agenda with haste. Lambe's story, like that of Wing Captain Elder, has never been satisfactorily told, and the researcher must reconstruct the influence of the Dunkirk bombing efforts through the lens of the Dover Patrol,¹⁴⁸ the most significant history of which was written by Bacon himself.¹⁴⁹

¹⁴¹ Layman, *Naval Aviation*, p. 68. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', pp. 29-30. Neville Jones, *The Origins of Strategic Bombing* (London: William Kimber & Co. Limited, 1973), pp. 57-9. Hobbs, *Royal Navy's Air Service*, pp. 71-80.

¹⁴² Raleigh, *WIA*, vol. I, p. 371.

¹⁴³ Gardiner, *The Flatpack Bombers*.

¹⁴⁴ Grattan, *The Origins of Air War*, pp. 144-5.

¹⁴⁵ Jones, *WIA*, vol. II, p. 339.

¹⁴⁶ Lee Kennett, *The First Air War: 1914-1918* (New York: The Free Press, 1991), p. 50.

¹⁴⁷ Rob Langham, *Bloody Paralyser: The Giant Handley Page Bombers of the First World War*, Kindle ebook (Oxford: Fonthill Media Limited, 2016), Chapter 2, loc. 401.

¹⁴⁸ Steve Dunn, *Securing The Narrow Sea: The Dover Patrol, 1914-1918* (Barnsley: Seaforth Publishing, 2017).

¹⁴⁹ Reginald Bacon, *The Dover Patrol 1915-1917*, 2 vols. (New York: George H. Doran Company, 1919).

Abbatiello somewhat remedied this situation by dedicating significant portions of thesis and book on the history of the RNAS and ASW to the bombing ‘at source’ policy pursued by Wing Captain Lambe.¹⁵⁰ The bombing itself is recorded by a number of histories and memoirs, notably including C. P. O. Bartlett’s account,¹⁵¹ the account of Paul Bewsher,¹⁵² and the history of No. 6 Squadron by Mike Westrop.¹⁵³ Future historians should undoubtedly focus on developing a precise history of the Dunkirk wing and Lambe’s role therein.

No. 3 Wing, under Wing Captain Elder, carried out operations against the Saar industries which were believed to be responsible for the production of steel used for U-boat construction.¹⁵⁴ This effort, although truly pioneering and potentially revolutionary in terms of its purpose and activities, was hounded out of existence by the Army and RFC, for a complex series of reasons related to inter-service rivalry and military necessity (see Chapter Five). Neville Jones, historian of First World War strategic bombing, rightly lamented the relative obscurity of RNAS No. 3 Wing in the historiography.¹⁵⁵ The bulk of the official coverage of the Navy’s strategic bombing campaign appears in Jones’ *War In The Air*, volume VI.

Squadron Commander Richard Bell Davies recalled the operations of the Short Strutter and Handley Page bombing squadron in his autobiographical memoir, *Sailor in the Air*,¹⁵⁶ and the topic is also briefly covered by Roger Gunn, in his biography of Raymond Collishaw,¹⁵⁷ the latter a Canadian fighter ace who also flew with Wing Captain Elder’s historic bombing wing. Flight Commander ‘Reggie’ Marix was also involved in the training establishment that paved the way for No. 3 Wing, as is discussed in his biography by John Lea.¹⁵⁸ Elder’s achievement is intimately connected with the employment of the Handley Page bomber in its first wartime operations and thus he has been mentioned in technical histories focusing on the bombing aircraft itself.¹⁵⁹ As with so many cases in the history of aviation during the First World War, the machines tend to generate more popular interest than the people who flew them. With the

¹⁵⁰ Abbatiello, ‘British Naval Aviation’, pp. 98-129 & Abbatiello, *Anti-Submarine Warfare*, pp. 59-81.

¹⁵¹ C. P. O. Bartlett, *Bomber Pilot 1916 - 1918*, ed. Chaz Bowyer (London: Ian Allan Ltd, 1974).

¹⁵² Paul Bewsher, ‘Green Balls’ *The Adventures of a Night-Bomber* (London: William Blackwood and Sons, 1919).

¹⁵³ Mike Westrop, *A History of No. 6 Squadron: Royal Naval Air Service in World War I* (Atglen: Schiffer Publishing, Limited, 2006).

¹⁵⁴ Jones, *WIA*, vol. VI, p. 118.

¹⁵⁵ Jones, *Origins of Strategic Bombing*, p. 23.

¹⁵⁶ Bell Davies, *Sailor in the Air*.

¹⁵⁷ Roger Gunn, *Raymond Collishaw and the Black Flight* (Toronto: Dundurn, 2013).

¹⁵⁸ John Lea, *Reggie, The Life of Air Vice Marshal R L G Marix CB DSO* (Durham: The Pentland Press Ltd, 1994).

¹⁵⁹ Langham, *Bloody Paralyser*, Chapter 4: Into Action, loc. 1006.

exception of George William's monograph, the history of No. 3 Wing remains almost entirely archival.¹⁶⁰

RFC 41st Wing and the Independent Force of the RAF

In October 1917 the RFC formed the 41st Wing and the RNAS contributed No. 16 Squadron's Handley Page aircraft for operations against German industry.¹⁶¹ However, like the RNAS No. 3 Wing before it, there is almost no literature specifically addressing the naval involvement in the 41st Wing's programme.¹⁶² The formation of the RAF on 1 April 1918 resulted in the transfer of the Dunkirk squadrons to the British Expeditionary Force (BEF) and with this move Roskill argued that the 'Admiralty's interest in long-range bombing operations... lapsed.'¹⁶³ Malcolm Cooper agreed that in early 1918 the Admiralty had lost control of its air programme and, following the creation of the RAF, exerted little if any influence on bombing developments for the remainder of the war.¹⁶⁴ The Independent Force, so strongly argued for by the proponents of long-range bombing within the Army, in fact materialized primarily as another air arm of the BEF. Under the leadership of Major-General Hugh Trenchard there was little else the Independent Force could be (see Chapter Five). Similar to the situation that emerged at Dunkirk during late 1917 and early 1918, the Independent Force's naval squadrons (No. 216 and later No. 215) were employed generally bombing railway junctions and enemy aerodromes, under the assumption that bombing these operational targets would do the most damage to Germany's war effort, and thus directly assist the BEF in the final phase of the war.

Admiral Mark Kerr, long a proponent of a unified air force, had predicted the need to develop a heavy bombing force during the debates in October 1917, stating that 'we must start at once with our preparations to lay their factories flat, and to destroy their aerodromes. This will

¹⁶⁰ George K. Williams, *Biplanes And Bombsights: British Bombing In World War I*, Kindle ebook (Pickle Partners Publishing, 2014), Chapter 1: No. 3 Wing, loc. 145. See also, History of No. 3 Wing, RNAS, undated, AIR 1/2107/207/42. See also, Wing Captain Elder, summary of No. 3 Wing history, 24 May 1917, AIR 1/2266.

¹⁶¹ Jones, *WIA*, vol. VI, pp. 122-3. See also, Grattan, *The Origins of Air War*, p. 50.

¹⁶² The only exception is E. D. Harding and Peter Chapman, eds., *A History of Number 16 Squadron: Royal Naval Air Service* (Peter Chapman, 2006).

¹⁶³ Roskill, *Documents*, p. 610.

¹⁶⁴ Malcolm Cooper, 'Blueprint for Confusion: The Administrative Background to the Formation of the Royal Air Force, 1912-19,' in *Journal of Contemporary History*, vol. 22, no. 3 (July 1, 1987), pp. 441, 446. See also, Malcolm Cooper, *The Birth of Independent Air Power* (London: Allen & Unwin, 1986), p. 109.

entail the building of 2,000 big bombing machines as a minimum'.¹⁶⁵ Kerr himself transferred to the RAF and went on to hold no less of a position than Deputy Chief of the Air Staff.¹⁶⁶ Although RNAS and Royal Naval officers were intimately involved in the evolution of long-range bombing, and played key roles in the RAF after its formation, the historiography only traces these developments in the barest outline. The history of the RNAS' role in the development of long-range bombing is thus open for further investigation.

The fact that the RNAS contributed two Handley Page bomber squadrons to the 41st Wing and then the Independent Force is rarely mentioned. Further, the truth that the 41st Wing, established in October 1917 to retaliate for the aeroplane attacks Germany had carried out against England beginning in June, was essentially an RFC led version of RNAS No. 3 Wing, which had itself been unceremoniously sabotaged and then dismantled by Director General Military Aeronautics (DGMA) David Henderson, Trenchard and Field Marshal Sir Douglas Haig only five months prior in May 1917, is unfortunately rarely addressed in the historiography of the origins of the RAF.¹⁶⁷ These changing circumstances have produced a dramatically skewed perspective in the literature, with No. 3 Wing almost invisible outside of the archives, and the RFC's 41st Wing and RAF's Independent Force achieving celebrity status, often without recognition of their naval components and background.¹⁶⁸

Air Defence of Britain, Zeppelin and Gotha Raiders

Another area in particular requirement of revision from the RNAS perspective is the air defence of Britain. Once again a subject of great popular interest has not yet been fully explored from the RNAS perspective. The secondary material has generally focused on two aspects of the history, the Zeppelin campaign against Britain, and the effort to defeat the Gotha and Giant bombers in

¹⁶⁵ 'Memorandum entitled 'Air Policy', dated 11 October 1917, addressed to Lord Cowdray, President of the Air Board, by Rear-Admiral Mark E. F. Kerr.' Cabinet G.T. 2284. Milner Papers, Bodleian, Box 122, Folio 84-5, #198 in Roskill, *Documents*, pp. 562-4. See also, Mark Kerr, *Land, Sea, and Air* (London: Longmans, Green and Co. Ltd., 1927), pp. 288-9.

¹⁶⁶ 'Correspondence between Lord Rothermere, President of the Air Board, and Sir Eric Geddes, First Lord, November-December 1917' ADM 116/1602, #252 in Roskill, *Documents*, p. 669, & 'Correspondence between Sir Eric Geddes, 1st Lord, and Sir William Weir, Secretary of State for the Royal Air Force, May 1918' ADM 116/1807, #210 in Roskill, *Documents*, pp. 592-3.

¹⁶⁷ Cooper, *Birth of Independent Air Power*, p. 64. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', pp. 40-1. Peter Gray, 'The Air Ministry and the Formation of the Royal Air Force' in *Changing War*, pp. 135-48. Eric Ash, *Sir Frederick Sykes and the Air Revolution 1912-1918* (London: Frank Cass Publishers, 1999), p. 126.

¹⁶⁸ Philpott, *The Birth of the Royal Air Force*, pp. 409, 817.

1917-1918. The RNAS played an essential role in both campaigns, however, the tendency has been to focus on the Home Defence squadrons themselves. Although primarily RNAS before 1916, after February of that year the responsibility for inland air defence changed to the RFC. The climax of both the Zeppelin and Gotha campaigns are thus generally perceived as Army aviation triumphs, rather than the more accurately combined effort that actually took place.

The RNAS involvement with the air defence of Britain began on 3 September 1914 when the Admiralty assumed responsibility for the airspace above the British Isles.¹⁶⁹ The formal transition occurred following an Admiralty meeting in October,¹⁷⁰ and Churchill pressed the Air Department to assume responsibility for home defence on the basis of the Navy's traditional role as the primary defender of Britain's coasts. Jones cited Churchill's *World Crisis* on this subject: 'the primary duty of the naval airmen was to repel attacks by hostile aircraft.'¹⁷¹ At any rate, the infrastructure required to enable the RNAS to fulfill this mandate did not at first exist as the naval air stations around England were still under construction during 1915.¹⁷² With the defensive capabilities still in development Churchill favoured offensive operations directly against the Zeppelin bases (see Chapter Five).¹⁷³ Layman explained Churchill's position as a stop-gap arranged at Minister of War Kitchener's behest, to free the RFC for operations on the continent.¹⁷⁴ The eventual result of the Air Department's efforts to build up Britain's air defences gradually produced a complex system comparable to a modern 'layered defence' system according to Goulter.¹⁷⁵

Due to the immense popular interest in the history of the Zeppelin, and its role as a violator of Britain's traditional maritime security from invasion, the literature on the Zeppelin raids is extensive.¹⁷⁶ From the outset the RNAS played a key role, first bombing German Zeppelin sheds and then intercepting the Zeppelins in the air. The first Zeppelin destroyed in the air was brought down by Flight Sub-Lieutenant Reginald 'Rex' Warneford, VC, RNAS, as is recounted in his biography by Mary Gibson and published by the FAA Museum, Yeovilton.¹⁷⁷

¹⁶⁹ Abbatiello, 'British Naval Aviation', p. 134.

¹⁷⁰ Jones, *WIA*, vol. III, p. 85.

¹⁷¹ Ibid, p. 75fn.

¹⁷² Maryam Philpott, *Air and Sea Power in World War I: Combat and Experience in the Royal Flying Corps and the Royal Navy In The Great War* (London: I. B. Tauris & Co. Ltd., 2013), pp. 143-6.

¹⁷³ Grattan, *The Origins of Air War*, pp. 144-5.

¹⁷⁴ Layman, *Naval Aviation*, p. 101.

¹⁷⁵ Goulter, 'Royal Naval Air Service', p. 57.

¹⁷⁶ Storey, *The Zeppelin Blitz*. Robinson, *The Zeppelin in Combat*.

¹⁷⁷ Mary Gibson, *Warneford, VC* (Yeovilton: The Fleet Air Arm Museum, 1979), pp. 89-92.

This phase of the RNAS air defence campaign is often associated with the initial development of the anti-aircraft defences of London and south-eastern England.¹⁷⁸ Less is said about the immense role played by the Royal Navy's warships operating in the anti-Zeppelin and coastal defence roles (see Chapter Six).¹⁷⁹

Most histories of 'the first blitz'¹⁸⁰ do not include RNAS Dunkirk in their calculations, a significant oversight that handicaps the resulting analysis by underrepresenting the important commitment of the RNAS on the continent to Britain's air defence. Furthermore, the official recollection is scattered across several histories: volume III of *The War In The Air* examines the Zeppelin raids, Volume V, the Gotha campaign,¹⁸¹ the role of RNAS Dunkirk is contained separately in Volumes II and IV.¹⁸² This fragmentation in the official histories naturally has resulted in difficulty appreciating RNAS air defence holistically. The most comprehensive source on the operational conduct of air defences, excluding Dunkirk, is Christopher Cole and E. F. Cheesman's statistical summation of the air raids.¹⁸³ Although a thorough and detailed source on the air defence campaign during the entire war, the volume is limited by its focus on Britain only. It is not generally recognized that RNAS Dunkirk aircraft were able to intercept raiders as they returned from England, or indeed that German raids were carried out against Dunkirk itself.

Gotha Raids of 1917, the Debate to Create the RAF, 'The First Blitz'

The literature on Britain's air defence merges into the debate surrounding the creation of the RAF. In the event the Gotha bombers sent to attack England in mid-1917 only managed to bomb London twice by day, while their entire night bombing campaign peaked after a few weeks in September. Since the focus in the literature is so firmly on the events leading to the creation of the RAF, the actual military necessity behind its creation is misconstrued. The exclusion of Dunkirk from the air defence historiography has reinforced this perception. The statistics kept by Cole and Cheesman, for example, clearly indicate that the RNAS effort dropped to almost zero

¹⁷⁸ John Ferris, '"Airbandit": C3I and Strategic Air Defence during the First Battle of Britain, 1915-18,' in *Strategy & Intelligence: British Policy During the First World War*, ed., Michael Dockrill (London: The Hambledon Press, 1996), pp. 23-66, & Ferris, 'Achieving Air Ascendancy: Challenge and Response in British Strategic Air Defence, 1915-40,' in *Air Power History*, pp. 21-50.

¹⁷⁹ Hobbs, *Royal Navy's Air Service*, pp. 122-3.

¹⁸⁰ Castle, *The First Blitz: Bombing London in the First World War*.

¹⁸¹ Jones, *WIA*, vol. III, pp. 69-152. Jones, *WIA*, vol. V, pp. 1-159.

¹⁸² Jones, *WIA*, vol. IV, pp. 78-108. Jones, *WIA*, vol. II, pp. 426-50.

¹⁸³ Christopher Cole and E. F. Cheesman, *The Air Defence of Britain 1914-1918* (London: The Bodley Head Ltd, 1984).

during the night raids in September, but this perspective discounts that the RNAS was in fact flying bombing operations against the enemy's aerodromes by night and that a significant proportion of the enemy's bombing effort was targeted against naval facilities (see Chapter Six). In a similar manner the fact that the RNAS at Dunkirk had loaned two squadrons, including No. 10 (Sopwith Triplanes - composed of pilots from the disbanded No. 3 Wing), to the RFC for duty on the Western Front, is not fully appreciated.¹⁸⁴ Although the contribution of the RNAS to the RFC's mission on the Western Front is frequently commented upon,¹⁸⁵ it is rarely acknowledged what impact this had on the RNAS involvement in Britain's air defence. As Grove has pointed out, the RNAS deserves much of the credit for the final victory against the Zeppelins, the German airships continuing to make limited attacks throughout 1917 and 1918. The destruction of the Zeppelin sheds at Tondern and the final destruction of *L70* with Peter Strasser, the chief of the Zeppelin force aboard, were both accomplished by former RNAS pilots.¹⁸⁶

The rationale for merging the two services is a constant theme in the air defence literature. Raymond Fredette, in his book *The First Battle of Britain*, lamented the state of knowledge concerning the 'maze of circumstances' that preceded the creation of the RAF.¹⁸⁷ Fredette pointed to the important role of Noel Pemberton-Billing, MP and former RNAS officer, who relentlessly denounced Lloyd George's government for its supposed failure to prevent the raids against London. The truth, however, is that the RNAS and RFC had actually defeated the daylight raiding effort, and the operations carried out subsequently at night were not accurate enough, or of a large enough scale, to cause significant damage unless the tempo of operations was so high so as to exhaust the German crews, a rate that could not be sustained for more than a few weeks.

Upon the creation of the RAF in April 1918, the Royal Navy 'lost almost all its experienced aviators' the consequences of which would eventually come home to roost during the Second World War.¹⁸⁸ Grove observed that the Admiralty's efforts to retain the RNAS were weakened by the apparent interchangeability of much of the late war RNAS regime with that of

¹⁸⁴ Mike Westrop, *A History of No.10 Squadron Royal Naval Air Service in World War I* (Atglen: Schiffer Military History, 2004), p. 11.

¹⁸⁵ Ralph Barker, *A Brief History of the Royal Flying Corps in World War I* (London: Constable & Robinson Ltd, 2002), p. 331. Jones, *WIA*, Appendices, p. 142. Bacon, *The Dover Patrol*, vol. II, pp. 245-7.

¹⁸⁶ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 53.

¹⁸⁷ Raymond Fredette, *The First Battle of Britain, 1917-1918* (London: Cassell and Company, Ltd, 1966), p. 8.

¹⁸⁸ Roskill, *Churchill and the Admirals*, p. 71.

the RFC, although these appearances were in fact illusory.¹⁸⁹ Like the long-range bombing and A/S campaigns, the former RNAS squadrons continued to play a role in Britain's air defence during 1918, however, that role has never been explored in the literature as the history of the RAF in its struggle with the German Army during the Spring Offensive of March and April 1918, leading to the One Hundred Days campaign in August, dominates the historical narrative.¹⁹⁰

Conclusions of the Literature Review

The historiography is in agreement that the rapid expansion of the RNAS, combined with its immense and changing wartime responsibilities, resulted in difficulty articulating a coherent naval aviation doctrine. The years 1914 to 1916 are generally considered years of confusion and capacity building, whereas 1917 and 1918, up to the creation of the RAF, in April 1918, are perceived as the period in which naval aviation achieved its pre-war promise, albeit too late in terms of the Admiralty's control of the naval air arm. The historiography, within this framework, has crystallized into niches. The war at sea has predominately evolved to mean the origin of the aircraft carrier and the proto-history of the FAA. The involvement of the RNAS in the protection of shipping has too often been marginalized or identified exclusively with air patrols that despite their vast quantity apparently yielded only limited concrete results. The air defence of Britain is perceived as an aberration, something the Navy should never have attempted. The RNAS's pioneering involvement in long-range bombing is treated as an RAF origin story, ironically playing to the inter-service rivalry that has dominated the history of Britain's naval aviation ever since.

The breadth and wealth of material relating to the history of the RNAS provides fertile grounds for historical investigation. The themes discussed above present a cross-section of the Royal Navy's enormous area of responsibility in the air, but is not to be considered a complete summary. In addition to the countless operational details and narratives, other elements of the RNAS role have been intentionally left for future study, judged to be too far outside the scope of this thesis. For example, the role of the RNAS with the BEF, the armoured car campaigns, and the use of seaplane carriers against the Bolsheviks in 1919 are all-important areas worthy of

¹⁸⁹ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?' p. 48.

¹⁹⁰ Jordan, 'The Genesis of Modern Air Power'.

further research. The vast scope of the RNAS efforts, and the complexity of the administrative, political and doctrinal aspects have contributed to the historiographical fragmentation. Although more specialized study is certainly necessary on several topics not fully treated in the literature, what is needed even more is a holistic appraisal that situates the RNAS in the context of the Royal Navy's mission during the First World War. The role of service practitioners and the RNAS and Royal Navy officers who administered the Air Department and the Air Division have been completely overlooked.¹⁹¹ No monograph length study exists on the history of these organisations, while the political and military context that shaped decisions has not been investigated from the perspective of naval aviation. While some of the key figures are well known, especially on the policy side of naval administration, the service practitioners who actually developed Britain's naval aviation – and fought the war - have remained largely anonymous.¹⁹² While this thesis does not claim to be a complete ethnography or prosopography of the RNAS, it does seek to establish the key personalities and their contributions, while putting the administrative decisions into context such that the development of Britain's naval aviation can be appreciated holistically, rather than in fragmented packets as the literature has hitherto reflected.

¹⁹¹ Ross Mahoney and Michael Molkentin, 'Introduction – The Cavalry of the Clouds? New Research in the Development and Experience of Air Power in the British Empire during the First World War', in *The British Journal of Military History*, vol. 4, no. 2 (2018), p. 5.

¹⁹² Roskill, *Documents*, p. xi.

Chapter Three: Fleet Naval Aviation

This chapter examines the evolution of the RNAS as a component of the fleet itself. The Naval Wing of the RFC first demonstrated the potential of fleet reconnaissance during the 1913 naval maneuvers, but conflict with the Central Powers in August 1914 necessitated new roles including gunfire spotting, anti-Zeppelin, and carrier strike missions. Although these capabilities had been theoretically envisioned before the war, actually operationalizing them proved more difficult. The RNAS met the challenge, in the end providing the fleet with a significant aircraft carrier capability in the form of the Flying Squadron of the Grand Fleet. This progress was not without its risks and there were a number of setbacks: the pre-war *RI* 'Mayfly' airship disaster, gunfire spotting limitations exposed at the Dardanelles, only a single seaplane flight at the Battle of Jutland, and the planning for the aerial torpedo attack against the High Seas Fleet base at Wilhelmshaven that fell through late in 1917, are all prominent examples that attest to the difficulty of matching material reality to theoretical vision. The multi-purpose nature of the RNAS roles is worth stressing, as the fleet did not operate aircraft in isolation from broader Air Department responsibilities.

This chapter is divided into four sections. First, it explores the development of rigid airships by the Royal Navy. This was a controversial and long delayed program that, although ultimately successful, has been generally relegated to specialized studies. The success of Germany's rigid airship program, and its rapid integration into the Imperial Navy as a reconnaissance and signaling platform, was observed with apprehension in Britain.¹ Despite significant progress made late in the war, the Royal Navy's rigid airships never lived up to their pre-war tactical expectations when compared with their Zeppelin counterparts. Second, the development of the aircraft carrier is considered. This section includes the origin of the seaplane carrier, the Cuxhaven and Tondern raids, and the planning for the Wilhelmshaven strike that would have been carried out had the war lasted into 1919.² Third, the chapter examines the use of naval aviation for gunfire spotting and reconnaissance, including the effort at the Dardanelles, the involvement of the RNAS in the destruction of the *Königsberg* at the Rufiji river delta, and

¹ Marder, *FDSF*, vol. I, pp. 336-7.

² Burns, *The RNAS and the Birth of the Aircraft Carrier*, Chapter 17: Wilhelmshaven 1919. Hobbs, 'The First Pearl Harbor,' pp. 29-38.

the utilization of the RNAS at the Battle of Jutland. Fourth, the chapter examines the Flying Squadron of the Grand Fleet, Rear-Admiral Richard Phillimore's aircraft carrier component that conducted the Tondern raid of July 1918.³ These examples were selected as representative of the broader thesis theme and the roles addressed in this chapter: the development of reconnaissance, naval gunfire spotting, and carrier strike missions.

Naval Airships: Unexpected Results

The Royal Navy was unable to provide the Grand Fleet with adequate airship cover for most of the war. This unfortunate state of affairs was the result of a major pre-war technical setback that produced negative long-term consequences so far as the development of rigid airship technology in Britain was concerned. Despite the setbacks, efficient rigid and non-rigid airships were built for the Royal Navy, and usefully employed to fulfill a variety of naval tasks. Admiralty First Lord Arthur Balfour had decided, in the summer of 1915, not only to press ahead with the development of the non-rigid Sea Scout blimps, but also with larger fleet rigid airships, as requested by Admiral Jellicoe. In the event, the long sought for Zeppelin type airships were finally delivered, but too late to impact the outcome of the war, and at a time when their utility itself had become questionable.

The Admiralty's efforts to match Count Zeppelin's work for the German armed forces spurred the development of the airship in Britain. Captain Reginald Bacon, the Director of Naval Ordnance, was the leading British advocate for the construction of rigid airships, and along with Frank McClean and Winston Churchill, can be considered one of the foremost godfathers of British naval aviation.⁴ Captain Bacon had been the Admiralty's representative at several Committee for Imperial Defence (CID) subcommittees, in particular two key air related committees. The first of these was the long-standing Advisory Committee for Aeronautics under Lord Rayleigh, John William Strutt, Chancellor of Cambridge University, and formerly the president of the Royal Society.⁵ The second was the Sub-Committee on Aerial Navigation, chaired by Lord Esher.⁶ Bacon, now charged with the design of the Navy's first airship, proposed

³ Development and Operations of the Royal Naval Air Service in Home Waters, Fleet Co-operation, Pt. I, January 1917 to April 1918, AIR 1/677/21/13/1901. See also, Till, *Air Power and the Royal Navy*, p. 115.

⁴ Grove, 'Seamen or Airmen?', p. 9, 12. Raleigh, *WIA*, vol. I, p. 125.

⁵ Kostas Gavroglu, 'Strutt, John William, Third Baron Rayleigh (1842-1919),' *ODNB* (Oxford University Press, 2004).

⁶ Pulsipher, 'Aircraft and the Royal Navy', pp. 31-2.

blueprints in July 1908.⁷ In December 1908, at a subcommittee meeting of the CID, First Sea Lord Admiral Sir John Fisher instructed Bacon to begin construction of the rigid airship.⁸ The design was refined by Vickers, and then finalized early in 1909.⁹ The CID appropriated £35,000 and Vickers spent another £50,000 on a shed at Cavendish Dock, Barrow.¹⁰

The result of these efforts was the technologically advanced but structurally weak airship *No. 1*, 'Mayfly'. Captain Murray Sueter, the Royal Navy's Inspecting Captain for Airships, was appointed as the chief Admiralty liaison with Vickers during construction.¹¹ Sueter had been on Lord Rayleigh's Advisory Committee for Aeronautics since its formation in 1908, along with Captain Bacon,¹² and was to become a lifetime proponent of airship development. Unfortunately for the development of rigid airship technology in Britain, the 'Mayfly' was wrecked on 24 September 1911 when its frame collapsed as it was being maneuvered out of its shed. It should be noted that airship accidents and setbacks were not at all uncommon, and a similar disaster had damaged Germany's *LZ7* beyond repair on 28 June 1910. Sueter seemed to share responsibility for the error that led to the 'Mayfly' breaking its back in strong wind, however his function was as an advisor rather than an overseer.¹³ Peter Brooks has argued that responsibility perhaps lay with Lieutenant Neville F. Osborne who was the Admiralty's technical advisor on airship development, or with Charles G. Robertson who was the actual manager at Barrow-in-Furness, where the Vickers Cavendish Dock was located.¹⁴

The Admiralty, following the 'Mayfly' fiasco, set out to reform its Airship Section, then stationed at Farnborough.¹⁵ In August 1912 it was decided to acquire some small non-rigid airships, of the 'Astra Torres' model from France along with a 'Parseval' model purchased from Germany, while Vickers would hopefully deliver another working rigid airship.¹⁶ Captain Sueter

⁷ Terms of Reference of the C.I.D. Sub-Committee on 'Aerial Navigation', dated 23 October 1908, CAB 38/15/3, #1 in Roskill, *Documents*, pp. 5-7.

⁸ John Fisher, *Memories* (London: Hodder and Stoughton, 1919), pp. 128-9.

⁹ Roskill, *Documents*, pp. 5-6.

¹⁰ Admiralty Air Department, Training Manual Part II (Naval Wing), 1914, AIR 1/824/204/5/71, pp. 114-5.

¹¹ Peter Brooks, *Zeppelin: Rigid Airships 1893-1940* (Washington, D.C.: Smithsonian Institution Press, 1992), p. 52.

¹² Extracts from Paper by Captain Murray F. Sueter, Director of Air Department, Admiralty, dated 29 August 1912, AIR 1/652, #18 in Roskill, *Documents*, p. 56. See also, Raleigh, *WIA*, vol. I, p. 159.

¹³ Edward Chilton, 'Rear-Admiral Sir Murray Sueter, CB,' in *CCHJ*, vol. 15, no. 2 (Summer 1984), p. 50.

¹⁴ Brooks, *Zeppelin: Rigid Airships*, p. 53.

¹⁵ Abbatiello, 'British Naval Aviation', p. 69.

¹⁶ F. Sykes, *Aviation in Peace and War* (London: Edward Arnold & Co., 1922), p. 31. Chilton, 'Rear-Admiral Sir Murray Sueter, CB', p. 50. Admiralty Air Department, Training Manual Part II (Naval Wing), 1914, AIR 1/824/204/5/71, p. 115.

was still optimistic about the prospects for Britain's airship development, and in fact was keen to start work on a second airship, but for the time being he believed the purchases of the older model airships along with a further £10,000 for experiments would be suitable.¹⁷ In October 1912 Sueter, now the Director of the Air Department, was still trying to arrange the purchase of a German built 'Parseval' semi-rigid type, priced at about £30,000.¹⁸

From the summer of 1912 until August 1914, the major interdepartmental council for the air services was the Air Committee, a joint service sub-committee established by the Secretary of the CID, Lieutenant-Colonel Maurice Hankey, and it was here that naval aviation policy was hammered out. The pre-war Air Committee was tasked with devising and attributing the respective functions of the RFC and RNAS, while also providing a forum for discussion of the latest technological developments. Vice-Admiral Jellicoe, as Second Sea Lord, became the committee's vice-chair, stepping in for Colonel Seely when required.¹⁹

Airships were a subject of frequent discussion at the Air Committee. The specifications for naval and military airships had been discussed on 7 November 1912, during the third meeting, for example.²⁰ Vice-Admiral Jellicoe, responsible for the personnel of the Naval Air Service,²¹ expressed his conviction that airships with their long endurance and superior station-keeping were well suited for naval use.²² In the spring of 1913 Jellicoe, with Alfred von Tirpitz's permission, had actually toured a Zeppelin.²³ By August 1914 the cost to be paid for delays and setbacks in airship development had been made evident. Without rigid airships for

¹⁷ Air Committee Minutes, Third Meeting, 7 November 1912, CAB 14/1, p. 22.

¹⁸ Director Air Department Captain Murray Sueter airship report, Air Committee, 8 October 1912, CAB 14/1, pp. 16, 18.

¹⁹ Raleigh, *WIA* vol. I, pp. 211-2. Air Committee, Committee of Imperial Defence, Minutes and Memoranda, July 1912 – August 1914, 'Minutes of the Sixth Meeting held at 2 Whitehall Gardens, S. W., on March 14th. 1913.' CAB 14/1, p. 76.

²⁰ Air Committee Minutes, Third Meeting, 7 November 1912, CAB 14/1, p. 22.

²¹ Jellicoe's reply to Balfour from *Iron Duke*, 28 August 1916, Admiralty MSS, #7 in A. Temple Patterson, ed., *The Jellicoe Papers*, vol. II (London: Spottiswoode, Ballantyne and Co. Ltd., 1968), pp. 68-9.

²² Admiralty MSS. 49038, 'Extracts from Jellicoe's autobiographical notes (Add. Mss. 49038, pp. 239-50)', #22 in A. Temple Patterson, ed., *The Jellicoe Papers*, vol. I (London: Spottiswoode, Ballantyne and Co. Ltd., 1966), p. 27.

²³ Admiralty MSS. 49038, 'Extracts from Jellicoe's autobiographical notes (Add. Mss. 49038, pp. 239-50)', #22 in Temple Patterson, *The Jellicoe Papers*, vol. I, p. 27. Description of a Flight by the German Siemens-Schuckert Airship, 5 December 1911, Hugh Watson and Alick Russell, Germany N. A. No. 36/11, #140 in Matthew Seligmann, ed., *Naval Intelligence from Germany: The Reports of the British Naval Attaches in Berlin, 1906 - 1914* (Aldershot, Hants: Ashgate Publishing Limited, 2007), p. 348. German Naval Airships and other Aerial matters, Hugh Watson, 24 April 1913, Germany N.A. No. 21/13, #197 in Seligmann, *Naval Intelligence from Germany*, p. 492.

communications and reconnaissance, the Grand Fleet was at a perceived tactical disadvantage compared to the High Seas Fleet.

The five seaplane stations built along the English coast before the war cost only £64,390 while the purchasing of 22 airplanes in 1912 was expected to cost a mere £35,308 compared with the £284,500 earmarked for four pre-war naval airship stations.²⁴ A single airship station, with its complex hydrogen storage system, could cost as much as £150,000 in 1914, a rigid airship itself a further £50,000 to £60,000.²⁵ In the event, the construction of all five pre-war naval air stations, plus their wartime expansion and construction of 19 new aerodromes, was calculated to cost only £556,785, whereas up to July 1915, £1,396,025 had been spent or allocated for what was planned as a total establishment of 22 airship stations, although these were non-rigid, rather than rigid, bases.²⁶ Rigid airship construction, since the *R1* disaster, had been generally abandoned, and thus despite the significant sums allocated to non-rigid and coastal airship development, the infrastructure for new rigid airship construction did not exist until 1916.²⁷ Aircraft clearly appeared to be the more economical option compared to rigid airship development.

The direct utility of aircraft in a fleet battle was, however, questionable. One important airship advocate at the Admiralty was Second Sea Lord Jellicoe who was not satisfied that the Admiralty was doing enough.²⁸ The Admiralty, unable to decide which direction to focus upon, did the only reasonable thing and endorsed both options. Indeed, as Ben Jones has observed, airships and their stations were by far the largest pre-war Air Department expense, and the extent to which First Lord Churchill subsequently claimed a certain lack of enthusiasm for airship development is therefore questionable.²⁹ By August 1914, nevertheless, the RNAS possessed

²⁴ Jones, 'Ashore, Afloat and Airborne', p. 62. Grove, 'Seamen or Airmen?', p. 17.

²⁵ Admiralty Air Department, Training Manual Part II (Naval Wing), 1914, AIR 1/824/204/5/71, p. 118.

²⁶ Jones, 'Ashore, Afloat and Airborne', p. 62.

²⁷ Construction facilities were at Barrow (Vickers), Inchinnan (Beardmore), Barlow (Armstrong), Cardington (Shorts), the training base was built at Cranwell in 1918, and rigid airship stations were built at Longside, East Fortune, Howden, Pulham and Kingsnorth, with a further station at Lough Neagh in Northern Ireland under construction when the war ended. See, Mowthorpe, *Battlebags*, p. 179.

²⁸ Jellicoe to Balfour, 10 July 1915, & Jellicoe to Admiralty, 29 July 1915, ADM 137/1953, #149 & #152 in Temple Patterson, *Jellicoe Papers*, vol. I, pp. 172-3.

²⁹ Roskill, *Documents*, p. 40 fn. Jones, 'Ashore, Afloat and Airborne', p. 62. Churchill, *The World Crisis*, vol. I, p. 273.

only two operational semi-rigid airships, therefore handing a significant tactical advantage to the German Navy.³⁰

To guard against the serious threat of the submarine, made evident by a number of warship losses early in the war, vigilant patrol of the coastline and waterways was required. The 'Parseval' type *No. 4* was used for this purpose early in the war to fly reconnaissance patrols over the English Channel.³¹ Fisher's return to the Admiralty at the end of October 1914 proved a boon for the airship service, and both Churchill and Fisher became convinced of the utility of non-rigid airships for A/S patrol. Indeed the silver lining of the airship story was the startling success of the non-rigid Sea Scout blimps, a forerunner of the naval helicopter.³² Focused on the stopgap of blimp patrols from RNAS air stations and the rapid expansion of aeroplanes, Churchill in February 1915 halted, and then on 12 March cancelled,³³ work on the only rigid then being developed in Britain, *No. 9*, which had been under construction by Vickers since March 1914.³⁴ Luckily for Jellicoe, not alone amongst the airship proponents with the fleet, Churchill's replacement following the May Crisis of 1915 soon resulted in a resumption of rigid airship construction.

The important political details of the May Crisis and the formation of the coalition government are too many and complicated to discuss in detail here. A series of boiling crises came to a head simultaneously, and when combined with the caprices of human fortune,³⁵ elevated the Unionists under Bonar Law to a coalition government with Asquith's Liberals. The personalities involved and vagaries of character included the recurring pressure of the popular press under Lord Beaverbrook (*Daily Express*) and Lord Northcliffe (*Daily Mail* and *London Times*). Let it suffice to say that the crisis originated in the spring of 1915, beginning with the German offensive of 22 April, Second Ypres, and then exacerbated by the costly landings at Gallipoli three days later. The news of the supposed shell shortage from the Aubers Ridge offensive of 9 May, disclosed by the *Times* on the 14th,³⁶ embarrassed the government and was

³⁰ Marder, *FDSF*, vol. I, p. 341. Jellicoe, *The Grand Fleet*, Chapter 2, loc. 546.

³¹ J. F. Hart, 'Airship Work for the Navy, 1914-1918,' in *Journal of the Royal United Services Institute [JRUSI]*, vol. 70, no. 479 (1925), p. 501.

³² Popham, *Into Wind*, p. 42.

³³ Higham, *The British Rigid Airship*, p. 127.

³⁴ Marder, *FDSF*, vol. IV, p. 5. Jones, 'Ashore, Afloat and Airborne', p. 40.

³⁵ Michael Brock and Eleanor Brock, eds., *H. H. Asquith Letters to Venetia Stanley* (Oxford University Press, 1985), pp. 592-600.

³⁶ 'Need For Shells' & 'Shells and the Great Battle,' 14 May 1915, *London Times*, pp. 8-9.

discussed at the War Council meeting that day.³⁷ The mood at Downing Street was one of ‘unrelieved gloom’ according to Hankey, the atmosphere ‘sulphurous’ according to Churchill.³⁸ Churchill told the War Council of the ominous news that two U-boats had most likely entered the area of operations, and that naval reinforcements - monitors, barges, gunboats, kite-balloon ships, A/S vessels, blimps, additional RNAS units and all forces necessary to make the operation a success - were required.³⁹

This was too much for First Sea Lord Fisher to stand for, and he expressed his conviction that the entire Dardanelles affair should never have been undertaken in the first place: the resources Churchill was asking for were being prepared for Fisher’s own Baltic phase of the naval war, and the First Sea Lord now implicated both War Minister Kitchener and the Prime Minister for failing to follow through with the original plan.⁴⁰ On the 14th the *Daily Mail* reported on Churchill’s admission to the House of Commons that HMS *Goliath* had been torpedoed and sunk by Turkish destroyers on the night before.⁴¹ Fisher resigned the following morning, confirmed his intentions to Asquith on the 15th, and then reinforced his decision to Churchill on the 16th. Three days later Fisher made his bid to Asquith for supreme naval command, the result of which was his the First Sea Lord’s departure on 22 May.⁴² Churchill, who had been the subject of press scrutiny since the inception of the Dardanelles campaign, learned that he was no longer to be included in the War Council on 16 May and then resigned as part of the required concessions to the Unionists for their support on the 25th.⁴³ HMS *Triumph* had been torpedoed by *U21* that same day, and this disappointing news reached Churchill on the 26th, his last full day. Former Prime Minister Arthur Balfour replaced Churchill and Admiral Sir Henry Jackson replaced Fisher, although Admiral Arthur Wilson had been Churchill’s original candidate for the job. David Lloyd George, previously Chancellor of the Exchequer, was

³⁷ Minutes of the War Council meeting, 14 May 1915, CAB 42/2/19.

³⁸ Marder, *FDSF*, vol. II, pp. 277-8. Churchill, *The World Crisis*, vol. II, chapter 18, loc. 5402.

³⁹ Fisher, *Memories*, p. 83. Churchill, *The World Crisis*, vol. II, chapter 18, loc. 5466-514.

⁴⁰ Fisher, *Memories*, p. 73.

⁴¹ ‘Loss of British Battleship,’ 14 May 1915, *Daily Mail*, p. 5.

⁴² Richard Freeman, *Tempestuous Genius: The Life of Admiral of the Fleet Lord Fisher*, Kindle ebook (Endeavour Press Ltd., 2015), Chapter 23, loc. 5124. Churchill, *The World Crisis*, vol. II, chapter 18, loc. 5800-27.

⁴³ Roskill, *Churchill and the Admirals*, pp. 50-1. Roy Hattersley, *David Lloyd George, The Great Outsider* (London: Abacus, 2012), p. 376.

appointed as the first Minister of Munitions.⁴⁴ Churchill took the non-Cabinet position of Chancellor of the Duchy of Lancaster on 27 May, the day *Majestic* was sunk, the third Royal Navy battleship lost at the Dardanelles within ten days.⁴⁵

The immense impact of these watershed events was rapidly felt on the RNAS, which within a few days had lost both of its principle political champions. Wing Captain Sykes was dispatched to the Dardanelles to clear up what was perceived as Churchill's mess and in July the RNAS Squadrons were subordinated to their district SNOs.⁴⁶ Sueter, without Churchill to protect him, was replaced by Rear-Admiral Vaughan-Lee in September.

Balfour ordered the resumption of work on airship *No. 9* in August 1915,⁴⁷ and then added three of the improved design, known as the 23-class, for order in October. These were airships *No. 23*, *No. 24* and *No. 25*, built by Vickers, Beardmore and Armstrong-Whitworth simultaneously, with a further five to follow in January 1916.⁴⁸ *No. 9* flew successfully on 27 November 1916, and, after a series of refits, was considered operational on 4 April 1917.⁴⁹ The three 23 class airships followed in October and November 1917, with *No. 26*, now *R26*, fitted out in April 1918. A fourth ship, *R27* was completed in March 1918 (but destroyed in its shed in August), and *R29*, which was to have some success as an A/S platform - involved in the sinking of *UB115* - was commissioned in June 1918.⁵⁰

Unfortunately the indigenous British airships were found to be under-powered and ill-suited for North Sea conditions.⁵¹ These performance deficiencies were compounded by the demonstrated vulnerability of Zeppelins to improved air defence fighters, now capable of firing incendiary ammunition, a development which began in 1916 and came to fruition in 1917. The result of this concern over speed, lift, and vulnerability was that the prototype airships were used only occasionally for convoy escort, and were primarily relegated to a training function.⁵² *No. 9*

⁴⁴ Paul Guinn, *British Strategy and Politics, 1914-1918* (Oxford: Clarendon Press, 1965), pp. 80-2. Alfred Havighurst, *Britain in Transition: The Twentieth Century*, 4th ed. (Chicago: University of Chicago Press, 1985), p. 120.

⁴⁵ Andrew Lambert, *Admirals* (London: Faber & Faber, Ltd, 2008), pp. 330-1. Rodger, *The Admiralty*, p. 132. Lord Beaverbrook, *Politicians and the War, 1914-1916* (New York: Doubleday, Doran & Company, Inc., 1928), pp. xxix-xxx.

⁴⁶ Admiralty Board Minutes, 9 July 1915, ADM 167/49.

⁴⁷ Marder, *FDSF*, vol. IV, p. 7. Higham, *The British Rigid Airship*, p. 128.

⁴⁸ Marder, *FDSF*, vol. IV, p. 7. Jones, *WIA*, vol. II, pp. 393-4.

⁴⁹ Jones, *WIA*, vol. II, p. 395.

⁵⁰ Grattan, *The Origins of Air War*, p. 155.

⁵¹ Jones, *WIA*, vol. IV, p. 41.

⁵² Jones, *WIA*, vol. IV, p. 41.

was hastily scrapped in June 1918.⁵³ The North Sea class of non-rigids, along with their smaller Coastal type counterparts were, however, used for fleet scouting and reconnaissance.⁵⁴

Commodore Sueter, the former airship advocate, had been replaced in September 1915 by Rear-Admiral Vaughan-Lee, the new Director Air Services. Sueter now became the Superintendent of Aircraft Construction, responsible for all departmental designs and contracts. Captain Norris was Sueter's Inspecting Captain of Rigid Airship Building, who also reported directly to the Third Sea Lord, Rear-Admiral Tudor. Wing Commander Robert Clark-Hall, formerly the Captain of HMS *Ark Royal* at the Dardanelles, was made the Assistant Superintendent for Design.⁵⁵ Kite-balloons were under the control of Squadron Commander Mackworth (formerly Major J. B. Mackworth, Royal Engineers), and Wing Commander Woodcock was the Inspecting Commander of Dirigible Airships Building.

Rear-Admiral Vaughan-Lee, in his drive to rationalize the Air Department and prevent 'water-tight compartments', reorganised the Airship section on 28 February 1916.⁵⁶ The Airship Section itself was now split into two branches, Construction & Supply, and Operations. Squadron Commander Woodcock was in charge of airship construction.⁵⁷ Captain Norris was placed in charge of the Construction branch with Squadron Commander Mackworth appointed the head of a separate sub-section for kite-balloons. Wing Commander Hunt was placed in charge of the Operations section. Hunt reported to the second Assistant Superintendent for Aircraft Construction (ASAC II), Norris, and was responsible for all airship operations, policy, personnel, stations, transport, foreign intelligence, diplomacy, meteorology, navigation, and records.⁵⁸ Thus within the Air Department it was the ASAC II - an awkward title shortly changed to Assistant Superintendent for Airships (ASA) - Norris and his deputy, Commander Hunt, who were responsible for all airship operations, with Commander Mackworth in charge of supply and kite-balloons.

Rigid and non-rigid construction pressed ahead during the re-armament year of 1916. 27 Coastal-type non-rigid airships were delivered that year, and four of the large North Sea class

⁵³ Marder, *FDSF*, vol. IV, p. 7. Ian Castle, *British Airships, 1905-1930* (Oxford: Osprey Publishing, 2009), p. 26.

⁵⁴ Jones, *WIA*, vol. IV, pp. 40, 42.

⁵⁵ Vivian's list of the chief engineers in the Air Department, 1916, NMM VIV/7.

⁵⁶ Director Air Services December 1915, Re-organisation of Airship Section, NMM VIV/7.

⁵⁷ II. Construction. Diagram of SAC section of Air Department, 1916, NMM VIV/7.

⁵⁸ Rear-Admiral Vaughan-Lee, Director Air Services 28 February 1916, Re-organisation of Airship Section, NMM VIV/7, p. 3.

were subsequently delivered in 1917, with the intention to work as fleet scouts covering the North Sea for the Grand Fleet.⁵⁹ These non-rigids proved more useful in the A/S and convoy protection roles than as fleet scouts due to their limited endurance and top speed. Nevertheless at the beginning of 1917 Beatty expected to use them for fleet purposes if available.⁶⁰

Much of the impetus to build the Royal Navy's rigid airships had been lost by the demonstration of the Zeppelin's vulnerability in battles over England in 1916, as well as by the stopgap development of blimps and flying boats. This meant that the Grand Fleet had to rely on what Jellicoe considered the uncertain aircraft of its seaplane carriers. In an attempt to placate the fleet leadership the Admiralty decided on 4 February 1916 to press ahead with rigid airship developments, and the Board subsequently reiterated its decision to build two rigid airships at the 7 April 1916 meeting.⁶¹ The Air Department still expected airships to act as reconnaissance, long-range gunfire spotting and wireless communication platforms.⁶² Vaughan-Lee was to be frustrated in his efforts, however, and the airship section was unceremoniously transferred to the Director Naval Construction by request of the Director Air Services on 19 October 1916, non-rigid construction having already been transferred in July.⁶³

A lucky stroke had changed the situation in September 1916. Germany's *L33* was shot down while over Britain and the wreck captured on the 24th. Soon a class of replicas became possible, of which five were ordered. Further details emerged from the wreck of *L48*, shot down in Suffolk on 17 June 1917, in addition to the captured *L49*, which was secured entirely intact when it came down in France on 20 October 1917.⁶⁴ These airships were reverse-engineered and improvements were integrated into the design of the new British rigids, from *R33* to the advanced *R36*, and the height-climbing types, *R38* to *R41*, ordered in June 1918.

By the autumn of 1917 the Admiralty intended to build more than a dozen of the Zeppelin type airships.⁶⁵ Then Minister of Munitions Winston Churchill was critical of the

⁵⁹ Marder, *FDSF*, vol. IV, p. 6. Jones *WIA*, IV, p. 40.

⁶⁰ Marder, *FDSF*, vol. IV, p. 6. Airships Instructions, Grand Fleet Battle Orders, 24 January 1917, ADM 116/1342, p. 416.

⁶¹ Admiralty Board Minutes, Friday 4th February 1916, ADM 167/50. Admiralty Board Minutes, Friday 7th April 1916, ADM 167/50.

⁶² Policy of RNAS, Rear-Admiral Vaughan-Lee, 1916, ADM 1/8449/39A

⁶³ Director Air Services to Admiralty Secretary, Organisation of Air Department, 19 October 1916, NMM VIV/7. Jones, *WIA*, vol. II, p. 356fn.

⁶⁴ Appendix I, German Naval Airships: 1912-1918, Jones, *WIA*, vol. III.

⁶⁵ Airships Construction Policy, August-October 1917, ADM 1/8621, #185 in Roskill, *Documents*, p. 531.

proposed utility of these vessels however the Fifth Sea Lord, Commodore Godfrey Paine, was committed to what had effectively been Jellicoe's policy all along, that the airships should prove as valuable as several light cruisers.⁶⁶ Jellicoe wholeheartedly backed the new rigids, and expressed his intention to build 16 of them, along with 20 new Coastal or North Sea types and another 20 Sea Scouts.⁶⁷ This not only reflected Jellicoe's awareness of Germany's rigid airship advantage, but was also a component of the material revolution the First Sea Lord had begun as part of the A/S campaign (see Chapter Four).

The airship staff were reorganised again at the end of 1917 by Admiral Jellicoe, who became the Chief of the Naval Staff that May. Jellicoe created a separate department of Airship Production as part of the Material Branch of the Naval Staff in December 1917.⁶⁸ This sub-branch was composed of a civilian Director of Airship Production, E. C. Given, and his staff, including a number of RNAS regulars, such as Wing Captain Edward Masterman and the former airship constructor Wing Commander Harold Woodcock, a significant move that preserved RNAS airship talent prior to the creation of the Air Ministry.⁶⁹ At the Air Department, prior to its unification with the Air Ministry, Wing Captain Maitland, one of the designers behind the Sea Scout blimp, was now the Captain Superintendent for Airships, proving to be the last link with the Air Department's rigid airship program.⁷⁰

By November 1917 the RNAS possessed four rigid airships and thus the Grand Fleet was finally closing with the advantage held by the High Seas Fleet.⁷¹ By November 1918 a small flotilla of Zeppelin type airships were under construction, *R33*, the first of which, would have been a useful addition to the fleet for relaying signals, jamming transmissions and conducting reconnaissance, had the war continued into 1919.⁷²

Prior to the armistice the Plan Division of the Naval Staff became increasingly significant for setting airship policy, although it was primarily concerned with A/S operations. The situation was now tenuous, the Royal Navy retained control over airship bases and procurement, whereas

⁶⁶ Notes by Mr. W. S. Churchill, Minister of Munitions, dated 11 October 1917 and reply by Commodore Godfrey Paine, 5th Sea Lord, undated, #185 in Roskill, *Documents*, ADM 1/8621, pp. 532-3.

⁶⁷ Air Policy, Notes of a conference aboard HMS *Queen Elizabeth*, 24 August 1917, ADM 137/1420, #83 in Temple Patterson, *Jellicoe Papers*, vol. II, pp. 201-2.

⁶⁸ Appendix C, Admiralty, End of December, 1917, list of members of the Naval Staff in, Jellicoe, *Crisis of the Naval War*, p. 288.

⁶⁹ Ibid.

⁷⁰ Ibid, p. 293.

⁷¹ Raleigh, *WIA*, vol. I, p. 172.

⁷² Castle, *British Airships*, pp. 30-4.

after 1 April 1918 their crews joined the RAF. Eric Grove observed that this arrangement was the result of an agreement between First Lord Geddes and Air Minister Sir William Weir regarding control of airships.⁷³

Ultimately the Royal Navy did receive the British Zeppelins that had been imagined back in 1909. However by the time these ships were delivered, starting late in 1918, their utility had diminished *vis-à-vis* the aircraft to such an extent that they were not seriously considered for fleet use. The smaller non-rigids that the Air Department developed and then procured in significant quantities during the war were more useful, although primarily in the A/S and protection of merchant shipping roles. This was certainly not the outcome that had been expected before the war, a lesson in terms of the unexpected results of new technologies, but also of the difficulty of closing the gap in complex material developments during wartime. In the event, Germany's Zeppelins proved less decisive as elements of the High Seas Fleet than had been predicted before the war, but Britain's delay in developing its own rigids resulted in stunted procurement that required several years to overcome. For both Germany and Britain the airship functioned as a naval weapon in ways very different from their intended purpose imaged before the war. The implications of the 1911 'Mayfly' disaster were thus profound as this single setback ultimately necessitated the development of aircraft for fleet purposes, the result of which was Britain's rapid adoption of seaplane and aircraft carrier technology.

Origin of the Aircraft Carrier

The inability to produce the rigid airships that could have fulfilled the Navy's requests for air support prior to the war had a profound impact on the future of the Naval Wing. Aircraft, being less technologically complicated yet apparently capable of fulfilling many of the same roles as the rigid airships, were expected to provide an economical alternative. Seaplanes, airplanes, and the aircraft carriers necessary to operate them thus became the mainstay of the RNAS's fleet component during the First World War. As the war progressed the airplane eventually surpassed and ultimately defeated the Zeppelins, establishing the heavier-than-aircraft as a core component of the balanced fleet.

The United States Navy's Eugene Ely first demonstrated that aircraft could indeed fly off of, and land back upon, a warship when he launched from the stationary USS *Birmingham* on 14

⁷³ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 52.

November 1910. Two months later on 18 January 1911 Ely successfully landed aboard USS *Pennsylvania*.⁷⁴ Similar experiments were taking place in Britain and on 18 November 1911 Commander Oliver Schwann took off from the water at Barrow Dock in a seaplane, erasing the result of the unsuccessful trials held that September.⁷⁵ Lt. Arthur Longmore then landed a Short seaplane in the River Medway on 11 December that year.⁷⁶ Commander Charles Samson was up to the task of actually replicating Ely's feat and successfully took off from a platform built above the forward turret of HMS *Africa* on 10 January 1912. Samson flew off HMS *Hibernia* while the warship was underway on 9 May 1912.⁷⁷ A track and trolley shipboard aircraft launching system had actually been patented by Captain Sueter, with assistance from Lieutenant-Commander F. L. M. Boothby and H. G. Paterson, near the end of 1911.⁷⁸ In another important milestone, newly promoted Squadron Commander Longmore dropped a 14 inch torpedo from his Short 81 seaplane on 28 July 1914, at Calshot.⁷⁹ These examples are representative of the steady technical progress made before the war. The inventive skills acquired by the Naval Wing practitioners during this experimental phase enabled the RNAS to adapt during the pressure of conflict in an unprecedented manner.

Indeed, the pre-war period was one of innovation and improvement for the Naval Wing. There were gaps in the progress, however. For example, although airborne wireless-telegraphy (W/T) sets had been tested - with the transmission of Morse code proven viable - it was not yet possible to *receive* transmissions while in an aircraft due to the engine noise overwhelming the receiver.⁸⁰ This was a disadvantage compared to the Zeppelin, in which larger wireless sets could be stationed in the cabin or in designated rooms isolated against engine noise.⁸¹ Another area that proved underdeveloped was the practice of gunfire spotting. Although the concept had been

⁷⁴ Michael Haskew, *Aircraft Carriers: The Illustrated History of the World's Most Important Warships* (Minneapolis, USA: Zenith Press, 2016), pp. 14-6.

⁷⁵ Grove, 'Seamen or Airmen?', p. 11. See also, R. Dallas Brett, *The History of British Aviation, 1908-1914*, vol. 1, 2 vols (London: The Aviation Book Club, 1933), p. 118.

⁷⁶ Hobbs, *Royal Navy's Air Service*, p. 32.

⁷⁷ Haskew, *Aircraft Carriers*, pp. 20-21.

⁷⁸ Richard Layman, 'HMS Ark Royal - 1914-1922,' in *CCIJ*, vol. 18, no. 4 (Winter 1987), p. 145.

⁷⁹ Royal Navy Aviation Firsts, Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 6. Extracts from The Life Story of Air Chief Marshal Sir Arthur Longmore, G.C.B., D.S.C. RAF Hendon, DC 74/102/39, p. 37.

⁸⁰ Admiralty Air Department, Training Manual Part II (Naval Wing), 1914, AIR 1/824/204/5/71, p. 77.

⁸¹ *Telefunken* radio-telegraphic sets had been installed starting with LZ6 in 1909, Belafi, *The Zeppelin*, p. 343.

tested by the RFC, it had not been examined by the RNAS and as a result had to be improvised during the press of operations.⁸²

First Lord of the Admiralty Churchill based his RFC (Naval Wing) policy on the development of coastal air stations from which seaplanes would patrol the coastline and aid the fleet. Churchill had in fact coined the term seaplane itself, shortening the unwieldy term hydro-aeroplane.⁸³ Churchill was at least in part following the advice rendered by the CID's Air Committee, of which Murray Sueter, Charles Samson, and John Jellicoe were all members. On 29 July 1914 Churchill wrote that 'the primary duty of British aircraft is to fight enemy aircraft and thus afford protection against aerial attack', reinforcing his commitment to essentially land-based operations.⁸⁴ Between September 1914 and February 1916 Churchill further shouldered the RNAS with responsibility for the air defence of Britain (see Chapter Six), as well as with the mission of bombing Germany's Zeppelin infrastructure (see Chapter Five). Procurement as a result was influenced by the need to develop efficient land-fighters and bombers, rather than the specialized aircraft (and ships) required for fleet operations. The decision to engage in defensive and offensive air warfare meant that the development of aircraft for use at sea was not the primary focus of the Air Department during Churchill's tenure. Although this policy limited seaplane and aircraft carrier development early in war, it conversely resulted in the development of excellent air interceptors, anti-Zeppelin fighters, and medium and heavy bombers that were uniquely suited to strategic air warfare.

Sueter, to his credit, was thinking along more specifically naval lines. In an Air Committee report of 29 August 1912 the DAD had elaborated the functions of the Naval Wing, including fleet reconnaissance, ASW, detecting mine layers, locating enemy surface vessels, supporting friendly submarines, air defence and other functions.⁸⁵ The leadership of the RNAS at the Air Department and the senior aviators and officers at the Central Flying Office, Sheerness, were familiar with the Royal Navy's traditional unwritten service doctrine, and were thus well equipped to identify the basic roles for naval aviation. The Royal Navy had successfully

⁸² Bell, *Churchill And The Dardanelles*, p. 121.

⁸³ Jones, 'Ashore, Afloat and Airborne.', p. 38. 'Admiralty Letter M.01495/12 of 2 November 1912 to the Admiral Commanding Coast Guard and Reserves', AIR 1/652, #20 in Roskill, *Documents*, pp. 61-2. DNC's Department, Admiralty, Aircraft Carriers, Part I: 1914 – 1918, January 1919, NMM DEY/95.

⁸⁴ Grove, 'Seamen or Airmen?', p. 25. Raleigh, *WIA*, vol. I, p. 274.

⁸⁵ Extracts from Paper by Captain Murray F. Sueter, Director of Air Department, Admiralty, 29 August 1912, AIR 1/652, #18 in Roskill, *Documents*, p. 59.

assimilated a tremendous number of technical innovations over the preceding century, ranging from steam propulsion, shell firing guns, torpedoes, electricity, W/T, fire control, and submarines. Aircraft represented only another layer of an already sophisticated system-of-systems. Churchill demonstrated that he recognized the importance of aircraft for naval affairs in an Admiralty minute dated 26 October 1913, describing the need for new aeroplanes and seaplanes for roles including air defence, coastal patrol, fleet work and long-range bombing.⁸⁶

Furthermore, the First Lord tasked the Director of Naval Construction (DNC), Sir Eustace Tennyson d'Eyncourt, to draft designs for a seaplane carrier in December 1913.⁸⁷ Over the preceding years several proposals for aircraft carrying ships had been described. Submarine Lieutenant Hugh Williamson, a future RNAS observer and staff officer, had for example produced an aircraft command-and-control ship concept in 1912.⁸⁸ For the 1913 naval maneuvers HMS *Hermes*, an 1898 pattern cruiser, had been modified to carry two seaplanes.⁸⁹ *Hermes* was captained by Captain G. W. Vivian, who was also responsible for the coastal air stations,⁹⁰ with Commander F. R. Scarlett, a recent CFS graduate, as the executive officer.⁹¹ Commander Samson took charge of *Hermes'* air contingent.⁹² *Hermes* was used by the red force, under Second Sea Lord John Jellicoe, against the blue force represented by the Home Fleet commander Admiral Callaghan, at the maneuver in July.⁹³

This exercise, which was generally accepted as a simulation of a German raid, included several air stations with *Hermes* meant to simulate Zeppelin involvement. *Hermes* launched the aerial reconnaissance missions, with support provided by flights from the Naval Wing station at Great Yarmouth.⁹⁴ The experience of the naval maneuvers was useful not only for testing air-sea

⁸⁶ Raleigh, *WIA*, vol. I, pp. 265-6.

⁸⁷ DNC Department, Admiralty, Aircraft Carriers. Part. 1. 1914 – 1918, January 1919, NMM DEY/95, pp. 3-4. Hobbs, *The Royal Navy's Air Service*, pp. 46-7.

⁸⁸ Aeroplanes for Naval Service, Hugh Williamson, March 1912, CCC WLMN 1/1, pp. 1-3. See also, Early Submissions made by Air Depart. To Obtain Suitable Seaplane Carrying Ships, 1915, AIR 1/2577.

⁸⁹ Popham, *Into Wind*, p. 12. Grove, 'Seamen or Airmen? The Early Days of British Naval Flying', pp. 17-18.

⁹⁰ Raleigh, *WIA*, I, p. 264.

⁹¹ Hobbs, *Royal Navy's Air Service*, pp. 52-3. Raleigh, *WIA*, vol. I, pp. 264, 271. Service record of Francis Rowland Scarlett, ADM 196/44/131.

⁹² Alan Smith, 'From Sail to Wing - The Career of Air Chief Marshal Sir Frederick Bowhill,' in *CCIJ*, vol. 25, no. 1 (1994), p. 4. Raleigh, *WIA*, vol. I, pp. 264-5.

⁹³ Marder, *FDSF*, vol. I, p. 353.

⁹⁴ Admiralty MSS, Jellicoe's response to Balfour from *Iron Duke*, 28 August 1916, #7 in Temple Patterson, *Jellicoe Papers*, vol II, p. 69. Employment of the Royal Flying Corps in the Manoeuvres Naval Wing, Extracts from the Second Annual Report by the Air Committee on the Royal Flying Corps, C.I.D. 190B, dated 9 May 1914, CAB 38/27/22, #41 in Roskill, *Documents*, pp. 137-8.

cooperation, but also as an exercise in the aerial location of submarines. Importantly, the limitations of W/T communication from the air were also exposed.⁹⁵ This practical experience improved the Naval Wing's proficiency with fleet operations, although *Hermes* was not retained and was paid off in October 1913.⁹⁶

The Admiralty Board, meeting that same month, appointed Second Sea Lord Jellicoe with the task of finding a suitable civilian vessel for conversion to a seaplane carrier in the 1914-15 timeframe.⁹⁷ Churchill, as we have seen, was behind this initiative and had authorized £81,000 for the conversion.⁹⁸ A partially constructed Blyth Company coal tramp steamer was not, however, requisitioned until the following May when it was designated as *Ark Royal*, the future 7,450 ton seaplane carrier.⁹⁹ This seaplane carrier had been designed by John. H. Narbeth, the Assistant Director of Naval Construction (ADNC), who later in the war became the principal designer of the battleship-to-carrier conversion, HMS *Eagle*. Narbeth was assisted by Constructor Charles J. W. Hope, of Blyth Shipbuilding and Dry Docks Company.¹⁰⁰ *Ark Royal*, featuring a 130-foot flying-off deck and capacity for five seaplanes and two airplanes was commissioned on 9 December 1914.¹⁰¹

In 1914 the CFS published its two-part RFC training manual, a landmark achievement that has been described as the first example of British air doctrine.¹⁰² The Army aviation half of the training manual was supplemented by a second volume, written by Wing Commander Frederick Sykes, and was printed in June 1914.¹⁰³ The RNAS has been subsequently criticized for failing to produce a similar supplement.¹⁰⁴ Indeed, Sykes himself criticized the Admiralty

⁹⁵ Burns, *The RNAS and the Birth of the Aircraft Carrier*, Chapter 1.

⁹⁶ Paul Fontenoy, *Aircraft Carriers: An Illustrated History of Their Impact*, (Santa Barbara: ABC-Clio, Inc., 2006), p. 3.

⁹⁷ Admiralty Board Minutes, Wednesday 29th October 1913, ADM 167/47.

⁹⁸ Layman, 'HMS Ark Royal', p. 146.

⁹⁹ Jones, *WIA*, vol. II, pp. 9-10. Grove, 'Seamen or Airmen?', p. 23. John Moore, ed., *Jane's Fighting Ships of World War I* (London: Random House Group Ltd, 2001), p. 85. DNC Department, Admiralty, Aircraft Carriers, part. 1. 1914 – 1918, January 1919, NMM DEY/95, p. 3.

¹⁰⁰ Fontenoy, *Aircraft Carriers*, p. 3.

¹⁰¹ Jones, *WIA*, vol. II, p. 10.

¹⁰² James Pugh, *The Royal Flying Corps, the Western Front and the Control of the Air, 1914-1918*, Kindle ebook (New York: Routledge, 2017), p. 30.

¹⁰³ Wing Commander Sykes, Training Manual Royal Flying Corps, Part I, May 1914, AIR 10/179. Sykes, Training Manual AP 144, Royal Flying Corps, Part II, Military Wing, 1915, AIR 1/785/204/558. Ash, *Sir Frederick Sykes*, pp. 40-1, 48.

¹⁰⁴ James Pugh, 'Oil and Water: A Comparison of Military and Naval Aviation Doctrine in Britain, 1912-1914,' in *A Military Transformed?*, ed. M. LoCicero, R. Mahoney, and S. Mitchell (Solihull: Helion, 2014), pp. 132-35.

effort for its apparent ‘slowness’ towards developing a clear set of roles for the RNAS.¹⁰⁵ The critics are not without grounds as the Naval Wing portion of the manual is revealing for its almost total lack of statements on purpose regarding aircraft roles or functions, although their handling, repair, construction, and history is described in detail.¹⁰⁶ A second volume, the Naval Air Service Training Manual, was published in November 1914, which reproduced the technical and historical material from the preceding edition, but again did not elaborate on missions or roles.¹⁰⁷

E. L. Gerrard, one of the original four naval aviators, and an instructor at the CFS, observed that in July 1914 the ‘aircraft required were still in the experimental stage’.¹⁰⁸ Walter Raleigh summarized that although training and experiments were progressing, as yet ‘...no attempt had been made to equip the force completely for the needs of war.’¹⁰⁹ Although prior to the war the Royal Navy had shown a serious commitment towards the development of naval aviation, nevertheless, only limited funds were available for aircraft as a significant portion of the total RNAS budget was still dedicated to the construction of the more expensive rigid airships and their support infrastructure. The delay in rigid airship development caused by the ‘Mayfly’ disaster, combined with the technical immaturity of the seaplane, meant that the Royal Navy joined the war without a dedicated aircraft carrier or fleet airship, relying in other words entirely on coastal bases for air support. Germany, in contrast, possessed a number of developed army airships which had been experimented with for fleet use. France, Japan, Russia, and the United States had all introduced converted seaplane carriers by 1914, and airship development was progressing.¹¹⁰

Anti-Zeppelin: Fleet Aviation in the North Sea from Cuxhaven to Jutland

Admiralty First Lord Churchill and Prime Minister Asquith worked from the outset towards finding offensive means to influence the war at sea. One of the early manifestations of this desire was the plan to use the RNAS to bomb the German Zeppelin bases at Cuxhaven.¹¹¹ For this

¹⁰⁵ Sykes, *Aviation in Peace and War*, p. 32.

¹⁰⁶ Admiralty Air Department, Training Manual Part II (Naval Wing), 1914, AIR 1/824/204/5/71.

¹⁰⁷ Naval Air Service Training Manual, November 1914, AIR 10/117

¹⁰⁸ 10 June 1920, ‘Some personal notes – 1914-1915, RNAS by Group Captain, E. L. Gerrard’ AIR 1/2301.

¹⁰⁹ Raleigh, *WIA*, vol. I, p. 272.

¹¹⁰ Layman, *Before the Aircraft Carrier*, pp. 17, 87, 96, 111.

¹¹¹ Brock, eds., *Letters to Venetia Stanley*, p. 285. Massie, *Castles of Steel*, p. 361.

purpose the Admiralty acquired a series of converted seaplane carriers: HMS *Empress*, commanded by acting Flight Commander F. W. Bowhill, HMS *Engadine*, under Squadron Commander L'Estrange Malone, and HMS *Riviera*. The three ships were collectively placed under Commodore Tyrwhitt's Harwich Force command.¹¹² The Cuxhaven raid was conducted on 24 December 1914 with the seaplane carriers, protected by 21 cruisers and destroyers, sortieing to deploy nine seaplanes armed with small bombs.¹¹³ Although the raid was not a success - the bombers were unable to locate or damage the target - the daring mission demonstrated the tantalizing possibilities of naval air strike.¹¹⁴

The raid was also an admission that the Zeppelins could not be stopped except by extreme measures. London soon became the target of Zeppelin bombing attacks, the first of which occurred in May 1915. This crisis month also witnessed the resignation of Churchill and Fisher over the conduct of the Dardanelles campaign. Up to this point, and indeed well afterwards, the RNAS had been divided across five distinct theatres (North Sea, Western Front, Home Defence, the Dardanelles, and East Africa), so it is no surprise that the RNAS expanded slowly as a specialized fleet auxiliary.

Additional aircraft raids were organized early in 1915, such as Commander Samson's operation against Ostend and Zeebrugge launched from *Empress*, with combined flights from the RNAS stations at Dunkirk, Dover, Eastchurch and Hendon. *Empress* was later scheduled to attack the East Frisian coast radio station in the spring of 1915, but the operation was scratched due to weather conditions, and Samson's No. 3 Wing deployed overseas to the Dardanelles shortly thereafter.¹¹⁵ With Samson re-deploying to Gallipoli, Wing Captain Charles Lambe took over at Dover as Senior Flying Officer (SFO), where he would work alongside Vice-Admiral Reginald Bacon, the commander of the all-important Dover district itself.

Sueter, juggling tasks at the Air Department, absorbed the reports on aviation that streamed in from the Dardanelles. Using these experiential reports to inform his departmental policy, Sueter produced a report that updated the roles of aircraft with the Grand Fleet. Sueter's internalization of the lessons of the Dardanelles, not surprisingly, produced a favorable

¹¹² Smith, 'From Sail to Wing', pp. 4-5.

¹¹³ Ibid, p. 5.

¹¹⁴ Massie, *Castles of Steel*, p. 365.

¹¹⁵ Smith, 'From Sail to Wing', p. 6.

impression of kite-balloons, while also recommending further development of seaplane carriers and anti-Zeppelin measures: all suggestions that were not lost on the Grand Fleet leadership.¹¹⁶

Unfortunately for Sueter the collapse of the Churchill-Fisher regime in May meant the departure of his patron and the strongest ally of the independence of the RNAS. The incoming Balfour-Jackson administration subordinated the RNAS commanders to their Royal Navy district counterparts, including the Grand Fleet C-in-C, various Mediterranean commands, the Dover Patrol, London, Yarmouth, and other districts.¹¹⁷ The RNAS Squadrons, coinciding with this major administrative shakeup, were upgraded to Wing status.¹¹⁸ Shortly afterwards in July 1915 the Admiralty declared the RNAS 'to be a branch of the navy under its own jurisdiction...'¹¹⁹ Sueter's position was also redefined in July when he was made responsible to the Sea Lords.¹²⁰ This was the beginning of Sueter's slow demise. So closely associated with the discredited Churchill, the former DAD was then further subordinated to the newly appointed Director Air Services (DAS), Rear-Admiral Charles Vaughan-Lee, who took office in September 1915. Sueter became the Superintendent for Aircraft Construction (SAC), responsible for all airship and aircraft technical development.¹²¹

Jellicoe, reflecting on the U-boat campaign and Zeppelin raids on public opinion in June 1915, considered coastal observation, air defence, and A/S scouting as the key aerial functions with the fleet.¹²² Coastal air patrol would play an important role, and Balfour soon informed Jellicoe that the reforms following the May Crisis were 'dovetailing the Air Service into the general naval system,' and had solved the 'discipline' issue. Balfour remained concerned with the lack of progress on airships.¹²³ To continue navalizing the RNAS, Balfour proposed the creation of a Board post for 'a naval officer of high standing,' to take charge of the Air Service. In fact Churchill had offered that exact job to Jellicoe in 1912, foreshadowing Jellicoe's creation

¹¹⁶ Employment of aircraft with the Grand Fleet, and statement on aircraft spotting, 1915, AIR 1/2577, p. 4. Appendix, AIR 1/2577, p. 5.

¹¹⁷ Yarmouth & Lowestoft Base Records, 1914-1918, vol 1. Compiled by the Historical Section., ADM 137/2237.

¹¹⁸ No. 203 Squadron, Royal Air Force. (Formerly No.2 Squadron, R.N.A.S.), AIR 1/695, p. 3.

¹¹⁹ Roskill, *Churchill and the Admirals*, p. 25.

¹²⁰ Instructions for Director of Air Department, dated July 1915, AIR 1/361, #73 in Roskill, *Documents*, p. 214.

¹²¹ 'Summary of Board Minutes relating to the Naval Air Service June-July 1915' #74 in Roskill, *Documents*, ADM 167/49, pp. 215-6.

¹²² Jones, *WIA*, vol. II, p. 355. Pugh, 'Conceptual Origins of the Control of the Air,' p. 304.

¹²³ Admiralty MSS, Balfour to Jellicoe letter, 26 August 1916, #7 in Temple Patterson, *Jellicoe Papers*, vol. II, pp. 66-7.

of the Fifth Sea Lord on the Admiralty Board, a position first held by Commodore Godfrey Paine in 1917.¹²⁴

The Admiralty's initial efforts to expand the Navy's seaplane carrier inventory did bear fruit. HMS *Vindex*, one of the 11 Isle of Man Steam Packet Company ships which were ultimately acquired during the war, had been purchased by the Churchill-Fisher administration for conversion to a seaplane carrier on 15 March 1915, and the work to convert it to a fast seaplane carrier was completed by August. *Vindex*, like *Campania*, *Engadine*, and *Manxman*, was another converted steamer, capable of keeping up with the battle fleet, and staying close to the battlecruisers. Cunard again handled the conversion, showcasing the close relationship between the Air Department and that liner company.¹²⁵ The design of *Vindex*, featuring a 64-foot flying-off deck, was repeated for several converted seaplane carriers, including *Manxman*, *Nairana* and *Pegasus*.¹²⁶ The final *Vindex* conversion could operate seven aircraft, or carry up to nine seaplanes and airplanes, and upon completion the carrier joined the Nore command.¹²⁷ Sueter, in one of his last actions as DAD on 30 August 1915, ordered trials to be carried out at Eastchurch with the goal of developing a method for launching off the ship's flying-off platform. The tests were successfully conducted between 27 September and 7 October and Flight Commander B. F. Fowler proceeded to launch from *Vindex's* deck in a Bristol Scout on 3 November.¹²⁸ *Vindex* was then transferred to the Harwich Force under the command of Commodore Tyrwhitt.¹²⁹

While these conversions were underway Admiral Jellicoe made do with the resources at hand. He modified his elaborate Grand Fleet Battle Orders - the plans for organizing the fleet in combat - in July 1915 to recognize the roles of aerial reconnaissance, air defence, A/S and mine patrol as essential duties of fleet aviation.¹³⁰ Jellicoe, however, required a more reliable means of countering the perceived enemy Zeppelin threat.¹³¹ The Grand Fleet C-in-C remained apprehensive about the High Seas Fleet's advantage in this regard as he had nothing more than

¹²⁴ Ibid, p. 68.

¹²⁵ Ian Burns and Roger Nailer, 'HMS Vindex - Mixed Carrier 1915-19,' in *CCIJ*, vol. 17, no. 3 (1986), p. 97.

¹²⁶ Ibid, pp. 98-9.

¹²⁷ Ibid, p. 99.

¹²⁸ Ibid, pp. 99-100.

¹²⁹ Ibid, p. 100.

¹³⁰ Jones, *WIA*, vol. II, p. 355. 'Grand Fleet Battle Orders. Volume I. August 1914 to May 31st, 1916' & 'Grand Fleet Battle Orders, Part VII. Sheets issued between Jan. 1916 and May 1916.' ADM 186/595

¹³¹ Temple Patterson, *Jellicoe Papers*, vol. II, p. 173.

light cruisers for his own scouting purposes. Jellicoe calculated that a single Zeppelin was 'equal to at least two light cruisers'.¹³² So long as he was at the Grand Fleet Jellicoe was adamant that more aircraft be provided.¹³³

RNAS Raiding Resumed, the Impact of Jutland and the 1916 Reforms

No solution had been found to counter the Zeppelins or submarines in 1915. The path forward was beset with hurdles. A series of raids planned for January and February 1916 were cancelled following aircraft failures and deteriorating weather. First Lord of the Admiralty Balfour hoped to return to the program of seaplane raids once the weather improved in the spring of 1916. Balfour believed the raids might be useful if they could prompt the High Seas Fleet to sortie, and thus face entrapment by the Grand Fleet.¹³⁴ Commodore Tyrwhitt's Harwich Force attempted to conduct air raids against the Zeppelin sheds at Hage and Hoyer, which Balfour hoped might prompt a fleet action.¹³⁵

The air raids recommenced on 20 March, starting with an operation against Houftave. *Vindex* and *Riviera* were to attack Zeebrugge as a diversion while the main raid was carried out by a mix of machines including French and Belgian aircraft for a total of 47.¹³⁶ A follow-up raid at what were believed to be the Hoyer Zeppelin sheds was conducted on 24 March, with the discovery that the true position of the Zeppelin sheds was at Tondern.¹³⁷ The seaplane carriers *Vindex* and *Engadine* conducted raids on 4 May, this time correctly targeting the sheds at Tondern. Of the eleven available machines only three made it to the target, and the limited means resulted ultimately in no effect.¹³⁸ A chance encounter during this operation interestingly did demonstrate that the Zeppelins were not invulnerable to surface vessels: light cruisers *Galatea* and *Phaeton* were able to bring down Zeppelin L7.¹³⁹

¹³² Marder, *FDSF*, vol. IV, p. 4. Layman, *Naval Aviation*, p. 164. See also, Pugh, 'Conceptual Origins of the Control of the Air', pp. 309-10.

¹³³ Extract from Minutes of Conference held Onboard H.M.S. Iron Duke on 12 October 1916 between Admiral Sir John Jellicoe, C-in-C, Grand Fleet and Rear-Admiral F. C. T. Tudor, 3rd Sea Lord, AIR 1/651, #138 in Roskill, *Documents*, p. 388. Jellicoe to the Secretary of the Admiralty, 29 July 1915, ADM 137/1953, ff. 9-10, #152 in Temple Patterson, *Jellicoe Papers*, vol. I, pp. 174-5. Pugh, 'Conceptual Origins of the Control of the Air', p. 304.

¹³⁴ Burns and Nailer, 'HMS Vindex', p. 103. Julian Corbett, *Naval Operations*, vol. III, p. 309.

¹³⁵ Corbett, *Naval Operations*, vol. III, pp. 273-4, 290-1. Marder, *FDSF*, vol. II, pp. 421-3.

¹³⁶ Burns and Nailer, 'HMS Vindex', p. 101.

¹³⁷ Ibid, pp. 101-2. Kemp, *Fleet Air Arm*, p. 55.

¹³⁸ Burns and Nailer, 'HMS Vindex', p. 104. Corbett, *Naval Operations*, vol. III, pp. 310-11.

¹³⁹ Corbett, *Naval Operations*, vol. III, p. 311.

In the Grand Fleet proper HMS *Campania* was the only attached carrier for most of the war. This former Cunard liner had been purchased by the Churchill-Fisher administration for £32,500 and refitted as a seaplane carrier.¹⁴⁰ In terms of its design principles, *Campania* became the model for the future seaplane carriers of the fleet, hanger rear, with flying-off deck fore.¹⁴¹ The 18,000 ton carrier could make at least 20 knots, the average speed for most of the fleet's carriers. Ideally the carrier would be fast enough to operate with the Battle Fleet, if not the Battle Cruiser Fleet.¹⁴² A seaplane equipped with disposable wheels was successfully launched on 6 August 1915.¹⁴³

Jellicoe defended the utility of *Campania* when there was talk of scrapping the ship and in October, based on the experience gained at the Dardanelles, he approved adding kite-balloons to the carrier.¹⁴⁴ In the event, it took until April 1916 to fit *Campania* with spotting balloons. By May 1916 *Campania* was equipped with seven Sopwith single-seaters and three Short two-seaters, for ten aircraft all together, plus a Caquot fixed balloon. Jellicoe's orders to *Campania* for 15 May subsequently emphasized 'short range reconnaissance and observation of enemy movements, with spotting as a secondary function'.¹⁴⁵ The crew had even carried out gunfire spotting practice on 29 and 30 May when that evening the seaplane carrier was ordered to make for sea.

The Grand Fleet's sortie and encounter with the High Seas Fleet on 31 May 1916 startlingly demonstrated how far the RNAS still had to go in terms of fleet cooperation. As H. A. Jones observed, HMS *Campania*'s seaplanes might have provided Jellicoe with some clear information regarding the deployment of the High Seas Fleet, precisely the information he needed, had *Campania* been able to catch up with Jellicoe's main force. *Campania* had been

¹⁴⁰ McBride, 'The Hatbox': HMS Argus', p. 74.

¹⁴¹ Layman, *Naval Aviation*, p. 103.

¹⁴² J. J. Colledge and Ben Warlow, *Ships of the Royal Navy, The Complete Record of All Fighting Ships of the Royal Navy* (Philadelphia & Newbury: Casemate, 2010), p. 58. Marder, *FDSF*, vol. III, p. 48.

¹⁴³ Jones, *WIA*, vol. II, p. 364.

¹⁴⁴ Letter No. 31/E/15 dated 8 October 1915 from Captain O. Schwann Commanding H.M.S. *Campania* to the Vice-Admiral Commanding Second Battle Squadron; covering Letter by Admiral Sir John Jellicoe, Commander-in-Chief, Grand Fleet, to Admiralty, dated 12 October 1915, and Minutes on above by Vice-Admiral H. F. Oliver and Rear-Admiral F. C. T. Tudor, AIR 1/636, #80 in Roskill, *Documents*, pp. 226-9.

¹⁴⁵ Campbell, *Jutland*, p. 26. See also, Orders and Memoranda issued by the Commander in Chief Grand Fleet for general Distribution, 1916 1st April to 30th June, Grand Fleet Battle Orders, 2 April 1916, ADM 137/2008, p. 39 & 39a

instructed to depart Scapa Flow last, so Captain Schwann was not underway until 12.40 am.¹⁴⁶ With reports of submarines in the area, and *Campania* lacking any destroyer escort, Jellicoe ordered the carrier back to harbour at 4:37 am.¹⁴⁷

The Battle Cruiser Fleet's (BCF) seaplane carrier, HMS *Engadine*, meanwhile did sortie from Rosyth at 10 pm and played a small role in the battle.¹⁴⁸ On 31 May between 2.40 and 2.45 pm, following a report from HMS *Galatea*, Vice-Admiral Beatty ordered *Engadine* to carry out seaplane reconnaissance in the hopes of locating what appeared to be a force of enemy cruisers.¹⁴⁹ Flight Lt. F. J. Rutland, with Assistant Paymaster G. S. Trewin as observer, flew the mission from *Engadine* at 3:08.¹⁵⁰ On the fourth of May Rutland had been tapped for the abortive Tondern operation aboard HMS *Vindex*, after which he had been temporarily held in Denmark as a stranded mariner. Less than a month later Rutland and Trewin were encountering anti-aircraft fire from the German light cruisers of the Second Scouting Group.¹⁵¹ Trewin used the aircraft's W/T set to report back to *Engadine* four times, describing elements of the enemy light cruiser screen.¹⁵² At 3.45 pm he transmitted that there were '[t]hree enemy cruisers and 10 destroyers steering south'. A final report was made at 3.48,¹⁵³ as it was now that a critical petrol pipe broke and Rutland was forced to turn back for *Engadine*.¹⁵⁴ Although the defect was quickly repaired, Rutland and Trewin were denied a second sortie.¹⁵⁵ Although the reports were successfully received aboard *Engadine*, they did not get through to Vice-Admiral Beatty aboard HMS *Lion*. HMS *Galatea* did get through with its own reports of the approaching enemy force, and with battle imminent Beatty decided against further air reconnaissance.¹⁵⁶

¹⁴⁶ Jones, *WIA*, vol. II, pp. 405-6. Campbell, *Jutland*, p. 26. Burns, *The RNAS and the Birth of the Aircraft Carrier*, Chapter 9. Marder, *FDSF*, vol. III, pp. 54-5.

¹⁴⁷ Jones, *WIA*, vol. II, p. 406. Marder, *FDSF*, vol. III, p. 326.

¹⁴⁸ Jones, *WIA*, vol. II, p. 407.

¹⁴⁹ Gordon, *The Rules of the Game*, p. 107.

¹⁵⁰ Campbell, *Jutland*, p. 33.

¹⁵¹ 'Documents relating to the Battle of Jutland. A. Signals, 30th and 31st May and 1st June 1916' and '(vii) Vice-Admiral Battle Cruiser Fleet to C-in-C' 3 June, 5pm., #228 in, Temple Patterson, *Jellicoe Papers*, vol. I, p. 266. Add.MSS.49014, ff. 40-58, 'Documents relating to the Battle of Jutland. A. Signals, 30th and 31st May and 1st June 1916' #228 in, Roskill, *Documents*, pp. 291-2. Rutland and Trewin had been under fire from *Frankfurt* and *Pillau*. Campbell, *Jutland*, p. 35.

¹⁵² Marder, *FDSF*, vol. III, p. 63. Jones, *WIA*, vol. II, p. 407. Cronin, 'Tondern: Prelude, Climax and Aftermath' p, 59.

¹⁵³ Jones, *WIA*, vol. II, pp. 407-8. Corbett, *Naval Operations*, vol. III, p. 333.

¹⁵⁴ Campbell, *Jutland*, p. 35.

¹⁵⁵ Jones, *WIA*, vol. II, p. 408. Young, *Rutland of Jutland*, pp. 3-5.

¹⁵⁶ Kemp, *Fleet Air Arm*, p. 57. Duncan Redford and Philip. D. Grove, *The Royal Navy, A History Since 1900* (New York: I. B. Tauris, 2014), p. 67.

The Harwich Force under Commodore Tyrwhitt had meanwhile sortied with its seaplane carriers, but was ordered back to harbour by the Admiralty.¹⁵⁷ In the event, Jutland seemed to reinforce the expectation that the RNAS could provide at best an uncertain auxiliary. *Campania*, after Jutland, was placed under repair where the carrier remained through the August 1916 sortie of the High Seas Fleet. This short cruiser battle was a missed opportunity for the Grand Fleet, in which Admiral Reinhard Scheer demonstrated his integration of submarine flotillas screened by as many as eight Zeppelins.¹⁵⁸

Despite the limited showing of the RNAS with the fleet during the summer of 1916, the naval forces at Rosyth, Dover and Harwich had to be content with their seaplane carrier conversions. The navy yards could not prioritize the two planned large carriers that were on order. The first of these had been ordered from the Beardmore works, hull No. 519, was a planned conversion of the *Conte Rosso*, an Italian liner capable of 19 and a half knots that was to become the 14,500 ton HMS *Argus*, did not however arrive at the Grand Fleet until October 1918. The novel nature of the conversion and design of *Argus* was complex, and one cannot fault Jellicoe for skepticism regarding the Admiralty's promises. Third Sea Lord Rear-Admiral F. C. T. Tudor believed *Argus* would not be completed until October 1917, when in fact the design had not yet been finalized as late as August 1917.¹⁵⁹ Lt. Commander Williamson had been a proponent of the flush deck design, with the funnels and superstructure located to the starboard.¹⁶⁰ Williamson's revised 1915 proposal was in fact approved by Sueter, who sent Williamson to the DNC, Tennyson D'Eyncourt, who in turn put Williamson in contact with assistant director J. H. Narbeth.¹⁶¹ Commander Gerard R. A. Holmes, formerly the constructor of *Campania*, produced a competing design.¹⁶² As built, HMS *Argus* could carry 20 machines in its

¹⁵⁷ Marder, *FDSF*, vol. III, p. 50.

¹⁵⁸ Martin Kender, 'The Manica and the Foundation of the British Kite Balloon Service,' in *CCIJ*, vol. 31, no. 4 (Winter 2000), pp. 226-7. Jones, 'Ashore, Afloat and Airborne', p. 39. Newbolt, *Naval Operations*, vol. IV, pp. 31-42.

¹⁵⁹ Extract from Minutes of Conference held Onboard H.M.S. *Iron Duke* on 12 October 1916 between Admiral Sir John Jellicoe, C-in-C, Grand Fleet and Rear-Admiral F. C. T. Tudor, 3rd Sea Lord, AIR 1/651, #138 in Roskill, *Documents*, p. 388. See also, Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 42.

¹⁶⁰ Richard Layman, 'Hugh Williamson and the Development of the Aircraft Carrier,' in *CCIJ*, vol. 13, no. 2 (Summer 1982), p. 70.

¹⁶¹ *Ibid*, p. 71.

¹⁶² *Ibid*, p. 72.

350 ft by 68 ft hanger.¹⁶³ Captain H. H. Smith took command of *Argus* when the ship was finally commissioned on 14 September 1918.¹⁶⁴

Argus was a critical missing component in the naval aviation system that was emerging within the Grand Fleet. It would have been the only carrier capable of safely recovering airplanes, which otherwise had to ditch in the uncertain North Sea and hope to be recovered by an escorting destroyer or friendly seaplane carrier. *Argus* would also be capable of carrying out torpedo strikes, adding a powerful offensive component to the fleet's aviation force. One of the many technical hurdles to overcome towards this ideal was the development of a suitable arresting system, for which some small funds had been appropriated by the Admiralty seaplane sub-committee during the summer of 1915. Tests were carried out on the Isle of Grain during 1916 with the result that a wire-arrester system was successfully installed aboard *Furious* in 1917.¹⁶⁵ An important associated development was the introduction of a compressed air catapult for take-off, of which hydraulic and electric variants were also trialed.¹⁶⁶

Although the RNAS expanded significantly during 1916, the fleet was still reliant on its relatively limited seaplane carriers for air support, and the RNAS still lacked the large fast carriers capable of launching and recovering airplanes. The RNAS training establishment was also expanded, with Captain Godfrey Paine assuming command of a separate RNAS depot at Cranwell in 1916.¹⁶⁷ A series of revised training manuals were published to solidify the wartime experiential learning, although the focus on technical details remained, less was said about the general purpose of the RNAS or its many roles.¹⁶⁸ The roles themselves had been identified at the administrative level by Admiralty First Lord Balfour and DAS Vaughan-Lee, and clarified by the Joint War Air Committee (JWAC) and Air Board in 1916 (see Chapter Five).

The Wilhelmshaven Plan of 1917

A hiatus occurred in Zeppelin base raids following the Battle of Jutland, and within six months Admiral Jellicoe had been promoted to First Sea Lord. With the reinvigorated U-boat campaign underway, naval planners began to look for a means of resuming the offensive. One of the most

¹⁶³ Moore, *Jane's Fighting Ships of World War I*, p. 84.

¹⁶⁴ Log of HMS *Argus*, 14 September 1918 to 31 January 1919, ADM 53/34046.

¹⁶⁵ Layman, 'Hugh Williamson', p. 72.

¹⁶⁶ Jones, *WIA*, vol. IV, pp. 22-3.

¹⁶⁷ John Taylor, *C. F. S. Birthplace of Air Power* (London: Jane's Publishing Company, Limited, 1987), p. 69.

¹⁶⁸ Director Air Services, Handbook of Aircraft Armament, July 1916, C.B. 1161, ADM 186/165.

ambitious projects under consideration was the plan to attack the High Seas Fleet in harbour with torpedo equipped aircraft.¹⁶⁹ Ultimately this proposal was the product of frustration caused by the difficulty of countering Germany's U-boats, as the submarine bases could not be directly attacked due in part to protection provided by the High Seas Fleet. A massed aerial torpedo attack seemed to offer the solution to the High Seas Fleet's relative invulnerability. Although the plan was never carried out it did produce subsidiary results that profoundly impacted the development of naval aviation with the fleet.

The first example of an aerial torpedo attack plan against Wilhelmshaven was proposed on 20 December 1915 by Lt. Commander de Courcy Ireland. Ireland, who was at that time stationed at RNAS Great Yarmouth, proposed a torpedo attack scheme that he circulated to the Air Department's staff. Lieutenant-Commander Williamson, Squadron Commander Seddon, Wing Commander Groves, SAC Sueter and DAS Vaughan-Lee all received copies.¹⁷⁰ Ireland's proposal was structured as a series of questions to which he did not yet have answers. First he observed the existing technical problems, an airplane capable of carrying torpedoes large enough to make the operation worthwhile would have to be designed. The existing 14 inch torpedoes, which in early 1916 could be carried by seaplanes, were deemed inadequate compared to the larger 18 inch and 21 inch torpedoes although there were no aircraft yet capable of carrying them.¹⁷¹ Unfortunately for the genesis of the project Lt. Commander Ireland, along with airship pioneer Wing Commander N. F. Usborne, were killed at Kingsnorth on 21 February 1916 while testing the experimental airship-plane design that fused a non-rigid envelope with a BE2 aircraft.¹⁷² The loss of these two experienced and creative practitioners was an irreplaceable double blow to the fleet's naval aviation and airship development. The torpedo attack plan seemed to evaporate.¹⁷³

With air supply transferred to the Ministry of Munitions and the rigid airship program stalled, Sueter for his part soon found his SAC position vanishing. Sueter was keen to see de Courcy Ireland's ideas fulfilled and he continued to propose air torpedo attacks against targets such as Wilhelmshaven, Pola and Kiel. Balfour's Admiralty however was eager to get rid of

¹⁶⁹ Marder, *FDSF*, vol. IV, p. 236.

¹⁷⁰ Commander Ireland's report to R. N. Air Station, Great Yarmouth, 20 December 1915, AIR 1/659.

¹⁷¹ *Ibid*, p. 3.

¹⁷² Warner, *Lighter Than Air*, Chapter 4, loc., 3742.

¹⁷³ Service record of Lt. Cmdr. W. P. de Courcy Ireland, ADM 273/2, p. 27

Sueter, who was now perceived as a member of the unified air force fifth column,¹⁷⁴ and thus in February 1917 Sueter was sent to Taranto, Italy, to establish a seaplane base.¹⁷⁵ Sueter, still trying to make to the best of his situation, hoped to expand the RNAS forces in theatre in preparation for a possible torpedo strike or bombing mission against Pola and Fiume. Sueter, along with Wing Commander Arthur Longmore, had done work for the Sopwith corporation that was now set to bear fruit in the form of the Sopwith T.1 torpedo-bomber. The airplane was successfully trialed in July 1917,¹⁷⁶ and a Short 320 torpedo-bomber followed suit, both airplanes capable of carrying the 1,000 lb, 18 inch, Mk. IX torpedo.¹⁷⁷

Grand Fleet C-in-C Admiral Beatty was meanwhile eager for offensive action against the High Seas Fleet. Beatty suggested the large-scale conversion of merchant vessels to carry torpedo capable aircraft, ultimately with the objective of conducting a massive 200 plane attack. Beatty had been influenced in this regard by a number of officers including Captain Herbert Richmond,¹⁷⁸ Third Sea Lord Frederick Tudor,¹⁷⁹ his replacement Commodore Lionel Halsey, Flight Commander Hugh Williamson,¹⁸⁰ and even Flight Lieutenant Rutland, who had all endorsed the plan. Beatty was marshalling support himself by August 1917.¹⁸¹

There were major material and technical hurdles to overcome. Beatty expected that 17 converted merchant ships would be required as carriers, for an initial total of 121 aircraft plus fighter support.¹⁸² Neither the ships nor the planes yet existed in the numbers Beatty required, and there was always the pressing concern regarding merchant shipping tonnage. Unprecedented

¹⁷⁴ Article proposing a 'Royal Air Service' from the *Globe* of 13 October 1915, AIR 1/361, written by Sueter for Charles Palmer, editor of the *Globe*, #81 in Roskill, *Documents*, pp. 230-3.

¹⁷⁵ Memorandum by Captain Murray F. Sueter, Superintendent of Aircraft Construction, on 'Policy to be Followed as Regards Development and Use of Torpedo-Carrying Seaplanes', dated 20 December 1916, with relevant Minutes by Members of the Board, ADM 1/8477, #150 in Roskill, *Documents*, pp. 434-43. Paul Halpern, ed., *The Royal Navy in the Mediterranean, 1915-1918* (Aldershot, Hants: Temple Smith, 1987), p. 14 fn. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 44.

¹⁷⁶ Marder, *FDSF*, vol. IV, p. 22.

¹⁷⁷ Jones, *WIA*, vol. IV, p. 33. H. F. King, *Armament of British Aircraft, 1909-1939* (London: Putnam & Company Limited, 1971), p. 310.

¹⁷⁸ Layman, *Naval Aviation*, p. 192.

¹⁷⁹ Marder, *FDSF*, vol. IV, pp. 21-2.

¹⁸⁰ Memo by H. A. Williamson, 'Torpedo Attack on German Fleet by Aircraft Proposals by Sqdn. CDR. Ireland,' Ireland (RNAS CO, Great Yarmouth) to Vaughan-Lee (DAS), 29 December 1915, AIR 1/659.

¹⁸¹ Marder, *Portrait of an Admiral, The Life And Papers Of Herbert Richmond*, ed. Arthur Marder (Cambridge: Harvard University Press, 1952), pp. 269-70. Marder, *FDSF*, vol. IV, p. 237. Extracts from Letter No. 2243/H.F.0022 of 11 September 1917 from Admiral Sir David Beatty, C-in-C, Grand Fleet, to the Admiralty entitled 'Considerations of an Attack by Torpedo Planes on the High Sea Fleet.' ADM 1/8486, #189 in Roskill, *Documents*, p. 541.

¹⁸² Hobbs, 'The First Pearl Harbor', p. 31.

high-risk operations requiring merchant ship conversions were unlikely to win support in the 1917 U-boat crisis environment.

The subject of a large-scale air attack was discussed aboard HMS *Queen Elizabeth* on 24 August with both Jellicoe and Beatty present, amongst others.¹⁸³ Beatty went to London shortly afterwards to discuss the idea with the Admiralty leadership.¹⁸⁴ Beatty's detailed proposal, submitted on 11 September 1917, called for 120 torpedo planes to launch from eight converted carriers.¹⁸⁵ Despite these modest steps Beatty was to be frustrated as in December, with the Admiralty riven by the crisis of Jellicoe's dismissal, the Wilhelmshaven plan fizzled out. Jellicoe for his part had tried to advance a similar project in October 1917, and he had submitted a proposal for bombing attacks against the Bremen submarine slips to be conducted by 30 aircraft, but even this modest project could not be achieved without diverting aircraft from A/S patrols, and was thus abandoned.¹⁸⁶ In the event the seaplane carrier strikes were not renewed until the Tondern Raid of July 1918.

Even the successful bombing of Tondern was hardly analogous to the launch of a full-scale torpedo attack against the High Seas Fleet in harbour. With the improvements in material by the summer of 1918 there was in fact some renewed interest in the Wilhelmshaven project. On 4 May Colonel Samson, now in charge of the Great Yarmouth air station, forwarded his revitalization of the de Courcy Ireland proposal to F. R. Scarlett, the Director of the Air Division (DAD) of the Naval Staff. This document represented Samson's answers to de Courcy's 1915 questions.¹⁸⁷ Samson wanted seaplanes capable of carrying 21 inch torpedoes, heavier than the 18 inch used by the Sopwith, Short, and Blackburn torpedo-planes.¹⁸⁸ He proposed 100 aircraft, or four squadrons of 20 torpedo airplanes, plus another 20 fighters for escort.¹⁸⁹ The attack would be preceded by a 48 hour photo-reconnaissance. Samson provided several options for

¹⁸³ 'Notes of a conference held on board H.M.S. *Queen Elizabeth*' 24 August 1917, ADM 137/1420, #83 in Temple Patterson, *Jellicoe Papers*, vol. II, pp. 197-9.

¹⁸⁴ Marder, *Portrait of an Admiral*, p. 270.

¹⁸⁵ Extracts from '... Admiral Sir David Beatty, C-in-C, Grand Fleet, to the Admiralty entitled 'Considerations of an Attack by Torpedo Planes on the High Sea Fleet.' 11 September 1917, ADM 1/8486, #189 in Roskill, *Documents*, pp. 541-3. AIR 1/6641, according to Layman, *Naval Aviation*, p. 198 n7. Hobbs, 'The First Pearl Harbor', p. 34. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 50.

¹⁸⁶ Air Raids Committee of the War Cabinet, first meeting 1 October 1917, Marder, *FDSF*, vol. IV, p. 239 fn.

¹⁸⁷ Colonel C. R. Samson, Suggested Aeroplane Offensive, 4 May 1918, ADM 1/8525/136.

¹⁸⁸ *Ibid.*, p. 1.

¹⁸⁹ *Ibid.*, p. 2.

positioning the carrier strike, and described the targets.¹⁹⁰ Like all other efforts to move the Navy towards an air torpedo strike, nonetheless, Samson's efforts ultimately yielded nothing. When the war ended the Navy's only torpedo strike component was aboard *Argus*, in the form of the 20 Sopwith T.1 torpedo-bombers of RAF No. 185 Squadron, that had formed at East Fortune on 7 October 1918 and joined *Argus* 12 days later.¹⁹¹

The case of the Wilhelmshaven plan is indicative of the constant juggling of priorities and the negative impact of that process on RNAS fleet developments. Like the rigid airship setbacks and the failures of aerial reconnaissance at Jutland, the Wilhelmshaven plan demonstrated the potential for fleet aviation but also its weakness: developing a fully realized torpedo strike capability during wartime crisis was not realistically possible. Once again the theory had been sound but material limitations doomed the project to remain on the drawing board. The significance of these developments, as with the case of gunfire spotting discussed below, is that they were envisioned at all, if nothing else a testament to the imagination of the RNAS officers and Grand Fleet leadership.

Gunfire Spotting: Impact of the Dardanelles & East Africa in 1915

Reconnaissance was the original function of the RNAS with the fleet, and this remained true despite the rapidly evolving technology. If the enemy were to intervene with his own fighters, naturally they must be suppressed and defeated to ensure the unfettered use of the air for reconnaissance, a pattern of conflict that was all too familiar to the RFC on the Western Front, where it was known as indirect artillery observation.¹⁹² Expectations were high that airplanes would provide a critical service beyond simply flying reconnaissance, it was believed that gunfire could in fact be directed from the air.¹⁹³

Gunfire spotting had first been proposed at meetings of the Air Committee in its pre-war incarnation under Colonel Seely and had been discussed as early as 31 July 1912. DGMA Henderson proposed the development of an Army seaplane for coastal spotting purposes and it was recognized that this development would also be of interest to the Admiralty.¹⁹⁴ Despite the

¹⁹⁰ Ibid, p. 5.

¹⁹¹ Newman, 'Pioneering Torpedo Training at East Fortune', pp. 150-1.

¹⁹² Raleigh, *WIA*, vol. I, pp. 342-3. Particular of H.M.S. *Ark Royal*. 'Unsigned and Undated paper, probably written early in 1915, AIR 1/361, #66 in Roskill, *Documents*, p. 203.

¹⁹³ Jones, *WIA*, vol. II, pp. 361-2.

¹⁹⁴ Statement by General Henderson, First Air Committee Meeting, 31 July 1912, CAB 14/1.

RFC conducting spotting trials,¹⁹⁵ the Navy had failed to recognize the utility of gunfire spotting beyond the theoretical and thus had not carried out any exercises as proof of concept before the war. The RNAS airmen and their observers were forced as a result to develop techniques *ad hoc* during the press of events.

The First Battle of Ypres in October 1914 indicated the likelihood that naval gunfire spotting would soon become a reality. During the Royal Marine and RNAS deployments along the Belgian coast, information from Squadron Commander Samson's air reconnaissance around Ostend and Zeebrugge was relayed by a circuitous route first to the Air Department and then through Churchill before being transmitted back to Rear-Admiral Horace Hood's naval forces. This was a line of communication that could not possibly offer accurate aerial spotting, although this was in practice what the No. 3 Squadron was actually attempting to do.¹⁹⁶ Churchill, to support Samson's operations, dispatched the converted seaplane carrier and RNAS parent ship HMS *Hermes* to the Belgian coast. Unfortunately the converted seaplane carrier became one of the first Royal Navy vessels lost to U-boat attack when it was struck by two torpedoes and sunk by *U27* on 31 October off Calais.¹⁹⁷ The Belgian coastal operations indicated that the RNAS could potentially do more than just strategic reconnaissance. If the flash-to-bang time between air reports could be reduced so as to enable reporting at the tactical level, supporting aircraft might be able to provide a naval contingent with a real force-multiplier for directing gunfire against shore targets.

The next test came when the RNAS deployed to the Dardanelles. Churchill and CNS Admiral Henry Oliver planned to use aerial gunfire spotting for the Dardanelles bombardment, and thus dispatched HMS *Ark Royal* to provide air support.¹⁹⁸ *Ark Royal* actually departed for the Dardanelles on 1 February and arrived at Tenedos on the 17th, a mere two days before the start of the bombardment.¹⁹⁹ Captained by Commander Robert Clark-Hall, an RNAS gunnery expert, it was now that *Ark Royal* should have been put to use practicing the missions it was expected to carry out, yet no practice was conducted and the option to do so was superseded by other priorities as *Ark Royal*'s air contingent was ordered to carry out photography and reconnaissance

¹⁹⁵ Raleigh, *WIA*, vol. I, p. 231.

¹⁹⁶ Important Signals Made and Received, 25 October 1914, Rear-Admiral Hood, HOOD 5/1 CCC, p. 15.

¹⁹⁷ Marder, *FDSF*, vol. II, p. 98.

¹⁹⁸ Bell, *Churchill And The Dardanelles*, pp. 93-4.

¹⁹⁹ Jones, *WIA*, vol. II, p. 10.

missions.²⁰⁰ Indirect gunfire carried out with HMS *Queen Elizabeth* during the first week of March proved unsuccessful, with the generally underpowered spotting seaplanes further hampered by poor weather and other technical problems. On 9 March Vice-Admiral S. H. Carden informed the Admiralty that he desperately required more air assets.²⁰¹ Carden was supported by Commander Clark-Hall who also submitted a report to the Admiralty that requested the delivery of improved aircraft, specifically new Short seaplanes - another admission of resource scarcity and corner-cutting.²⁰²

Despite the importance of the mission there simply were no other purpose built seaplane carriers although the hurried conversion of merchant steamers was still underway. The Sterling Telephone Company W/T supplied to *Ark Royal*'s seaplanes were still 'in a virtually experimental stage...' but they were used in combat nonetheless.²⁰³ On 14 February, only five days before the start of operations, Carden issued a detailed set of orders discussing his plan of attack and including a section on gunfire spotting.²⁰⁴ Carden's orders acknowledged that aircraft could not receive W/T signals from ships, and therefore, all messages back to the aircraft would have to be sent by spotlight, if at all. Carden's revised 24 February orders expected that the spotting aircraft would supplement the spotting ships, and a destroyer was specifically tasked with relaying the spotting signals to the firing warship.²⁰⁵ Carden's instructions included a set of W/T procedures that required the spotting Captain (D) of the escorting destroyer to communicate by spotlight with the spotting aircraft and the Dardanelles commander emphasized that '[c]areful and accurate sending is more important than speed.'²⁰⁶

Vice-Admiral Carden's detailed orders, although ingenious, were indicative of the disconnect between theory and practice. Carden's code system could in theory enable an airborne spotter to state, for example, a 'shot falls 40 yards to the right and 300 yards short of the target' by means of a complex radio-spotlight communication system. Digesting and operationalizing the system however would have been a herculean achievement within a month, let alone the

²⁰⁰ Layman, 'HMS Ark Royal', p. 149. Marder, *From the Dardanelles to Oran*, p. 5.

²⁰¹ C. F. Aspinall-Oglander, *Gallipoli*, vol. I (Uckfield: The Naval & Military Press Ltd, 1929), pp. 86-7 fn.

²⁰² Layman, 'HMS Ark Royal', p. 152.

²⁰³ Ibid, p. 149.

²⁰⁴ Vice-Admiral Commanding Eastern Squadron Mediterranean, Carden, Orders for forcing of the Dardanelles by the Allied Squadron, HMS *Queen Elizabeth*, 14 February 1915, CCC DRBK 4/3, p. 6.

²⁰⁵ Admiral Carden, Instructions for Aircraft, 24 February 1915, CCC DRBK 4/3, p. 6.

²⁰⁶ Vice-Admiral Commanding Eastern Squadron Mediterranean, Orders for forcing of the Dardanelles by the Allied Squadron, HMS *Queen Elizabeth*, 14 February 1915, CCC, DRBK 4/3, p. 6. See also Appendix I, Signals between Spotting and Firing Ships.

mere days that elapsed between their issue and the start of the bombardment.²⁰⁷ Carden's system predated any that the Air Department eventually developed.²⁰⁸

Ark Royal's RNAS contingent successfully flew spotting missions for battleship gunfire and was also used to conduct reconnaissance and photography missions over the peninsula.²⁰⁹ Small 20 lb bombs and *flechettes* were also dropped during close air support missions.²¹⁰ The high tempo of operations produced some set backs, such as on 5 March when Flight Commander Williamson, then acting as an observer, was injured when the propeller of his seaplane broke up in mid-air.²¹¹ That same day Flight Sub-Lieutenant E. H. Dunning was more successful, providing HMS *Queen Elizabeth* with gunfire spotting support. Dunning flew a particularly memorable mission on 25 March when he singlehandedly piloted and conducted the spotting for HMS *Majestic*.²¹² These examples demonstrates that despite the steep learning curve and material limitations, the RNAS practitioners were getting a grip on the difficult task of gunfire spotting.

Admiral Carden, worn out from the months of intensive planning, was forced to relinquish command by medical order on 16 March and his second in command, Vice-Admiral John de Robeck, took over.²¹³ On 16 and 17 March *Ark Royal's* aircraft even succeeded in locating enemy mines, but failed to do so on 18 March with disastrous consequences. The pre-dreadnoughts *Irresistible* and *Ocean* as well as the French *Bouvet* were all sunk when they steamed into a minefield. HMS *Inflexible* was damaged, then the command of Captain Richard Phillimore, the future Admiral Commanding Aircraft.²¹⁴ With the operation stalled and reinforcements inbound from Britain, *Ark Royal's* sailors were utilized as the work party for the establishment of the RNAS base at Tenedos from which Samson's No. 3 Squadron would operate once in theatre.²¹⁵ *Ark Royal* deployed a seaplane apiece to the cruisers *Doris* and *Minerva* and was then sent to conduct various port strike, spotting and reconnaissance missions

²⁰⁷ Corbett, *Naval Operations*, vol. II, pp. 143-5.

²⁰⁸ Layman, 'HMS Ark Royal', p. 149.

²⁰⁹ Marder, 'The Dardanelles Revisited'.

²¹⁰ Layman, 'HMS Ark Royal', p. 149.

²¹¹ Ibid, p. 151.

²¹² Ibid, p. 152.

²¹³ Bell, *Churchill And The Dardanelles*, p. 137.

²¹⁴ Layman, 'HMS Ark Royal', p. 151.

²¹⁵ Samson, *Fights and Flights*, p. 218.

in the Gulf of Smyrna and the Gulf of Enos, before returning to Gallipoli to carry out spotting missions for HMS *Agamemnon* and HMS *Lord Nelson* between 12 and 15 April.²¹⁶

The arrival of Kapitanleutnant Hernig in *U21* resulted in the torpedoing of the pre-dreadnoughts HMS *Triumph* (25 May) and HMS *Majestic* (27 May), losses that forced *Ark Royal* to return to Imbros where the seaplane carrier acted henceforth as a depot ship, although the seaplanes aboard continued to function in the capacity of reconnaissance, spotting, and A/S patrol.²¹⁷ In November *Ark Royal* was dispatched to Salonika, where the carrier remained until March 1916.²¹⁸

The proof of RNAS's unpreparedness for carrying out gunfire spotting at the Dardanelles had been plainly demonstrated by Commander Clark-Hall's struggle to provide the Dardanelles bombardment with the gunfire spotting it required. There is another element in this case that is particularly revealing. In April 1915 Rear-Admiral Bacon, then in command of the Dover patrol, held gunfire spotting trials in which seaplanes from HMS *Riviera* spotted for the old battleship HMS *Revenge*. Commander E. Altham's detailed report on the *Revenge* trials, combined with the other and other gunfire spotting experiences including the Dardanelles, led to the establishment of a special fire-control school at the Calshot naval air station where training commenced on 21 June 1915.²¹⁹ The RNAS in other words had been committed to the task of gunfire spotting before the any mission training existed, a sterling example of the pioneering spirit of the early aviators.²²⁰

A simultaneous gunfire spotting operation was in fact taking place in German East Africa, modern Tanzania, where Squadron Commander J. T. Cull was in command of RNAS No. 4 Squadron.²²¹ This maritime operation involved a naval gunfire spotting mission conducted against the German light cruiser *Königsberg* that had been blockaded in the Rufiji River delta. *Königsberg* was destroyed by its crew in July 1915 after a crippling bombardment carried out by

²¹⁶ The Turkish battleship *Turgud Reis*, formerly SMS *Weissenburg*, was even the target of an unsuccessful bombing mission launched from *Ark Royal* on 15 April. Ibid, p. 152. Layman, 'HMS Ark Royal', pp. 152-3.

²¹⁷ Ibid, p. 153.

²¹⁸ Ibid, p. 154.

²¹⁹ Jones, *WIA*, vol. II, p. 363.

²²⁰ Jones, *WIA*, vol. II, pp. 362-3. Bacon, *The Dover Patrol*, vol. I, pp. 114-5.

²²¹ Wing Commander J. T. Cull, History of R.N.A.S. operations in East Africa, November 1914 to January 1917, AIR 1/725/106/1.

Royal Navy monitors and directed by RNAS seaplanes, specifically Squadron Commander R. Gordon and Flight Sub-Lieutenant Arnold in their Henri Farman.²²²

It can be seen that the RNAS went to the Dardanelles improperly trained and equipped, but emerged with an impressive proficiency at gunfire spotting despite this. The independent destruction of the *Königsberg* further demonstrated the resourcefulness of the RNAS when it came to gunfire spotting, suggesting that Churchill's faith in the organisation's ability to adapt to circumstances was not misplaced. Adaptability and innovation however could not compensate altogether for technological limitations, casualties, and lack of standardized training.

Kite-Balloon Carriers in the Mediterranean

Undetected mines, as the experience in the Dardanelles had also demonstrated, could dramatically impact the outcome of a naval campaign. As a stop-gap solution until suitable aircraft or airships became available, Jellicoe insisted that kite-balloons be added to the Grand Fleet's inventory.²²³ HMS *Engadine* had a balloon fitted and trialed with success in North Sea conditions during the summer of 1915.²²⁴ HMS *Campania* was also modified to operate kite-balloons in April 1916. By May the following year, balloon winches had been installed aboard nine battleships, two battlecruisers, *Glorious* and *Courageous*, four light cruisers and three destroyers, with a total of 15 battleships and three light cruisers additionally fitted by the time of the armistice.²²⁵

Kite-balloons were not to be confused with the pre-war kites of pioneer Samuel Cody who had been employed by the Navy before the war to create a naval kite, an enterprise that was never pursued.²²⁶ Cody went on to work on the Navy's semi-rigid airships, but was killed in a crash in 1913. The new kite-balloons, equipped with telephone sets, provided for instantaneous tactical communication and had been battle tested during the Dardanelles campaign where they proved a stable platform for gunfire spotting and mine location.²²⁷

²²² Jones, *WIA*, vol. III, p. 11. Report of Fregatten-Kapitan Looff, 11 July 1915, p. 2. German Narrative of Events Leading up to the loss of the 'Koenigsberg', ADM 137/4297, p. 5.

²²³ Temple Patterson, *Jellicoe Papers*, vol. I, pp. 138-9.

²²⁴ Kender, 'The Manica and the Foundation of the British Kite Balloon Service', p. 226.

²²⁵ *Ibid*, p. 227.

²²⁶ Bill Finnis, *History of the Fleet Air Arm*, pp. 7-9.

²²⁷ Marder, *FDSF*, vol. IV, p. 6.

The practicality of naval spotting by balloon had first been demonstrated by Wing Commander Maitland, while in command of a balloon detachment directing monitor fire against German positions between Nieuport and Coxyde in October 1914 during the first battle of Ypres. The fixed spherical balloons used were of limited utility, however, and were especially contingent upon weather conditions.²²⁸ Maitland was then appointed to Roehampton to establish a balloon training school that was opened in March 1915.²²⁹ With the preparation for the Dardanelles operation gaining steam Flight Commander Mackworth, before taking charge of the carrier HMS *Manica*, was sent to France to observe the balloon factory at Chalais-Meudon, where he arrived in February.²³⁰ *Manica* itself had been requisitioned by the Admiralty and converted to carry Kite Balloon Section No. 1, departing on 27 March for the Dardanelles.²³¹

On 19 April *Manica* directed the 6 inch gunfire of HMS *Bacchante* to good effect against an enemy camp and Flight Commander Mackworth was pleased with the results.²³² He observed that kite-balloons proved superior for communication and produced greater reliability of gunfire spotting as a result.²³³ It was *Manica*'s balloon observer who spotted the Turkish battleship *Turgud Reis* and directed HMS *Triumph*'s fire against it, forcing the ship to withdraw on 25 April, the day of the main landings.²³⁴ The following day *Manica* was also detailed to spot for *Queen Elizabeth* and did so effectively against the Kojadere magazine. *Ark Royal* carried out operations in conjunction with *Manica* on 27 April when the *Ark Royal*'s seaplanes and *Manica*'s balloons were both utilized to spot for *Queen Elizabeth* against *Turgud Reis*, although unable to destroy the enemy warship before it again withdrew.²³⁵ Also on the 27th *Manica* directed *Queen Elizabeth*'s fire against the seized English transport *Scutari* and destroyed it at a range of seven miles, another notable milestone for aerial gunfire spotting. Turkey retaliated and launched air attacks against the *Manica*, and attempted to bomb the balloon carrier unsuccessfully.²³⁶

²²⁸ Kender, 'Manica and the Foundation of the British Kite Balloon Service', p. 223.

²²⁹ Ibid, p. 225.

²³⁰ Ibid, p. 223.

²³¹ Ibid, p. 223. Jones, *WIA*, vol. II, pp. 33-4.

²³² Jones, *WIA*, vol. II, p. 35.

²³³ Kender, 'Manica and the Foundation of the British Kite Balloon Service', p. 224.

²³⁴ Ibid, p. 225.

²³⁵ Layman, 'HMS Ark Royal', pp. 152-3.

²³⁶ Kender, 'Manica and the Foundation of the British Kite Balloon Service', p. 226.

The use of kite-balloons to supplement the technological limitations of aircraft for spotting paralleled the ad-hoc creation of the Sea Scout non-rigid airships for the A/S campaign in the North Sea. Kite-balloons had several advantages but also significant limitations, making them an important but soon obsolete stop-gap. With the balloons real-time communication from spotter to ship by telephone was the norm, a luxury compared to the less reliable one-way radios carried aboard *Ark Royal*'s seaplanes. On the other hand, the balloons were vulnerable to counter-air attack, while the balloon ships themselves had to expose themselves to possible submarine attack to carry out their mission - something *Ark Royal* could theoretically avoid given the greater mobility and range of its seaplanes.

The success of *Manica* was noticed by the Admiralty, prompting several additional conversions. HMS *Hector*, in addition to *Menelaus*, *City of Oxford*, and *Canning*, were all fitted with balloons. *Canning* arrived at the Dardanelles in October 1915 and was present at the evacuation that December before redeploying to Salonika until May 1916 when it was sent back to Britain, carrying the wreckage of Zeppelin LZ85 for study. *Canning* later became the balloon depot ship for the Grand Fleet.²³⁷ *Manica* and *City of Oxford* were later converted into seaplane carriers.²³⁸

In the spring of 1917 the Grand Fleet Air Committee (GFAC) report recommended termination of further development of balloon ships. What was now required, following the reintroduction of unrestricted submarine warfare in February, was more merchant shipping and the balloon ships could be converted back to that purpose. Furthermore, the kite-balloons appeared more useful for convoy defence rather than fleet gunfire spotting. The experience of Jutland had indicated that the promise of gunfire spotting in naval battle was not to be realized, given the likelihood of rapidly changing battle conditions. On 5 July 1917 Admiral Beatty used an experimental squadron of destroyers equipped with kite-balloons to conduct ASW, and on 12 July HMS *Patriot* was able to depth-charge *U69* with the assistance of a balloon spotter (see Chapter Four).²³⁹ By the end of the war 65 sloops and 38 destroyers (and 11 United States Navy vessels) had been fitted with kite-balloons.²⁴⁰

²³⁷ Ibid, p. 226

²³⁸ Ibid, p. 226

²³⁹ Ibid, p. 227. See also, Dwight Messimer, *Verschollen: World War I U-Boat Losses* (Annapolis: Naval Institute Press, 2002), p. 88.

²⁴⁰ Director Naval Construction Tennyson D'Eyncourt, Aircraft Carriers, part II, January 1919, NMM DEY/95, p. 3.

In the Mediterranean in 1917, as in the North Sea, the balloon effort was focused on A/S measures. Kite-balloon stations were built under the authority of Vice-Admiral Somerset Gough-Calthorpe in December at Malta, as well as at Brindisi and Alexandria. Gough-Calthorpe, the former Second Sea Lord, was responsible for trade protection and balloons offered a ready-made early warning system and observation post for a naval base, air station or convoy.²⁴¹ By the time the RAF was formed No. 1 and No. 6 balloon bases were stationed at Malta and Bizerta, while in the Adriatic No. 3 and No. 4 were stationed at Brindisi and Corfu. No. 2 balloon group was located at in Egypt at Alexandria and No. 5 balloon base had been established at Gibraltar.²⁴² Gibraltar, Malta and Egypt were convoy escort hubs, and the Adriatic groups' primary mission was to provide balloon support for the convoys. Additional bases were being built at Port Said, Genoa and Milo with the purpose of denying U-boats entry to the Austrian fleet base at Pola.

The kite-balloon experience again highlighted the adaptability of the RNAS but also exposed limitations that had not been addressed before the start of the war. The kite-balloons were utilized only as a result of the failure of seaplanes to conduct routine gunfire spotting and mine reconnaissance. Like the Navy's airships the balloons ultimately found their utility as a component of the A/S campaign, rather than in the purpose they had initially been designed for. Once again the RNAS underwent a profound transformation in theory and practice within the period of only two years. An entirely new system of gunfire spotting was introduced in 1915, capabilities were expanded during 1916, and then the mission was redefined completely in 1917-18.

The East Indies & Egypt Seaplane Squadron

Before returning to the North Sea, and the developments following Jutland, the history of the unique albeit transitional East Indies & Egypt Seaplane Squadron (EIESS) is worth considering. This squadron was initially formed for operations in the Eastern Mediterranean, under Squadron Commander Malone and then under Wing Captain Samson's command, following the conclusion of the Dardanelles campaign at the end of 1915. Samson's No. 3 Squadron had originally been dispatched to the Dardanelles on 26 February, prior to Admiral Carden's 8 March

²⁴¹ Kender, 'The Manica and the Foundation of the British Kite Balloon Service', p. 227.

²⁴² Ibid, p. 227.

request for additional air support.²⁴³ During the Dardanelles campaign Samson had arrived at Imbros on 23 March and soon relocated to Tenedos with his newly purchased (French) aircraft.²⁴⁴ Between 28 March and 9 November Samson's pilots flew 394 gunfire spotting missions, each flight lasting nearly two hours or longer.²⁴⁵ These missions were multipurpose and what started as a routine gunfire spotting mission could suddenly transform into an aerial dogfight, as happened to Flight Commander Busk on 2 December, when the ship he was spotting for was suddenly attacked by an enemy Taube airplane prompting Busk into a successful counterattack that drove off the enemy.²⁴⁶

The buildup of forces at the Dardanelles and at East Africa, unfortunately for Jellicoe, Beatty and Tyrwhitt, meant splitting up the already thin airplane and seaplane capacity of the fleet. HMS *Ben-My-Chree*, taken up for conversion on 1 January 1915, was another of the converted civilians liners from 1908, in this case the flagship of the Isle of Man Steam Packet Company's steamers, built by Vickers Sons and Maxim Ltd at Barrow, and capable of over 24 knots.²⁴⁷ The speed is significant as it would have made *Ben-my-Chree* a useful addition to the Grand Fleet, and especially the battlecruisers, had Balfour not sent it to the Dardanelles in June 1915.²⁴⁸

Ben-My-Chree arrived at Iero Bay, Lesbos, on 12 June bringing with it an untested torpedo capability from its Short seaplanes.²⁴⁹ It was these Short 184 seaplanes from *Ben-My-Chree* that carried out the historically significant torpedo attacks against Turkish shipping that summer.²⁵⁰ In late July *Ben-my-Chree* was to be found spotting for the monitor HMS *Roberts* and in September some of *Ark Royal*'s seaplanes were embarked aboard monitors *Roberts* and *Raglan* to assist with their numerous gunfire spotting missions. *Ben-my-Chree* transferred a Short seaplane, along with Flight Lieutenant Dacre, to *Roberts* to assist with the seaplane spotting work while the carrier was conducting other missions.²⁵¹ *Ben-my-Chree* conducted spotting for HMS *Cornwall* at Gallipoli on August 9, shortly before the aerial torpedo attacks

²⁴³ Bell, *Churchill And The Dardanelles*, p. 128.

²⁴⁴ Samson, *Fights and Flights*, pp. 218-9.

²⁴⁵ R. C. M. Pink to DAS, Royal Naval Air Service, Communique No. 3, 22 December 1915, AIR 1/2577, p. 2

²⁴⁶ R. C. M. Pink to DAS, Royal Naval Air Service, Communique No. 4, 5 January 1916, AIR 1/2577

²⁴⁷ Ian Burns, 'Woman of My Heart - The Story of Ben-My-Chree, Part I,' in *CCIJ*, vol. 6, no. 4 (Winter 1975), pp. 145, 147.

²⁴⁸ *Ibid*, p. 148.

²⁴⁹ *Ibid*, p. 149.

²⁵⁰ Layman, 'HMS Ark Royal', p. 154.

²⁵¹ Burns, 'The Story of Ben-My-Chree, Part I', p. 151.

that took place on August 12 and 17. Flight Commander C. H. K. Edmonds carried out the first attack off Injeh Burnu against a large steamer, previously the subject of torpedo and gunfire attack by British submarine *E14*, and Edmonds successfully hit the Turkish ship with his 14 inch torpedo.²⁵² Edmonds repeated this feat on August 17, badly damaging another Turkish steamer that was subsequently towed back to Constantinople. That same day Flight Lieutenant Dacre torpedoed a Turkish tugboat stationed at False Bay as he was taxiing on the water, heralding aerial torpedo developments yet to come.²⁵³

The Dardanelles operation ended on a low note for the RNAS: the original mission of forcing the straits had not been achieved and the RFC had assumed operational responsibility for what had become primarily an Army operation. Wing Commander Sykes, simultaneously Colonel Frederick Sykes, RFC, had been sent by the incoming First Lord of the Admiralty Balfour and Minister of War Lord Kitchener to report on British air forces at the Dardanelles on 25 May, the peak of the May Crisis.²⁵⁴ Sykes arrived on 24 June already promoted to Wing Captain, also holding rank in the Royal Marines.²⁵⁵ Working in this capacity as a prototype combined arms commander, Sykes was able to administer all naval and army requests for air support and as a result introduced the wing structure to the Admiralty's oversized squadrons, including Samson's that now became No. 3 Wing.²⁵⁶ The operational experience gained had been immense, both at the Dardanelles and against the *Königsberg*, and the practicality of naval gunfire spotting had been demonstrated.

Vice-Admiral de Robeck's post-evacuation naval establishment required two seaplane carriers and two kite-balloon carriers, in addition to No. 2 Squadron under Wing Commander Eugene Gerrard at Imbros, plus an airship base at Mudros.²⁵⁷ By the beginning of 1916 the Air Department had dispatched a significant number of seaplane and balloon carriers, and this force was now collected together at the recommendation of Sykes' replacement Wing Captain F. R. Scarlett, along with a pair of Royal Navy monitors, to act as a mobile striking force in the Eastern Mediterranean: the prototype of an aircraft carrier group.²⁵⁸ The formation of a single

²⁵² Ibid, p. 153.

²⁵³ Ibid, p. 153. Jones, *WIA*, vol. II, p. 64.

²⁵⁴ Ash, *Air Revolution*, pp. 75-6.

²⁵⁵ Ibid, p. 77. Grove, 'Air Force, Fleet Air Arm – or Armoured Corps?' p. 37.

²⁵⁶ W. A. B. Douglas, 'The R.N.A.S. in Combined Operations 1915-1914,' in *Dreadnought to Polaris: Maritime Strategy since Mahan*, ed. A. M. J Hyatt (Vancouver: The Copp Clark Publishing Company, 1973), p. 27.

²⁵⁷ Jones, *WIA*, vol. V, p. 370.

²⁵⁸ Ibid, p. 371.

squadron was at first resisted by Vice-Admiral de Robeck who believed that the seaplane carriers operating along the Egyptian coast were best kept with the C-in-C East Indies.²⁵⁹

Thus on 7 January 1916 *Ben-my-Chree* was transferred to the Eastern Mediterranean as part of the EIESS, formed at Port Said under 24 year-old Squadron Commander Cecil L'Estrange-Malone, who was supported by Lt. Erskine Childers as intelligence officer.²⁶⁰ In March 1916 the squadron included *Ben-my-Chree*, *Empress*, and two converted German freighters, now the seaplane carriers *Anne* and *Raven II*.²⁶¹ On May 14 Wing Commander Samson arrived to take charge of the EIESS, minus *Empress* which was deployed to the Bulgarian coast, while L'Estrange-Malone took command of *Raven II*, acting as Samson's executive officer with Flight Lieutenant T. H. England as his SFO.²⁶² The carriers were grouped together with monitors *M15* and *M26* to provide a mobile bombardment force. On 18 May the group successfully bombarded the El Arish forts and airfield, damaging the latter and successfully destroying the former.²⁶³ On 3 June *Empress* flew gunfire spotting missions for HMS *Grafton* and the monitor *Earl of Peterborough*, against the railway bridge north-east of Scala Nuova.²⁶⁴ Although there had been difficulty developing gunfire spotting doctrine earlier in the war, by this point in 1916 a close degree of cooperation between seaplane carriers and monitors had developed, creating a unique and flexible naval task force. Samson was in fact carrying out joint and combined operations, writing after the war that 'I had to work for both the Navy and the Army, and also operate in the French Naval zone of the Syrian coast.'²⁶⁵

Vice-Admiral Wemyss, the newly appointed C-in-C East Indies, next dispatched the EIESS to the Red Sea hoping to keep watch on the Gulf of Aden.²⁶⁶ Samson, well known for his offensive spirit, proceeded to conduct strike missions against Aden, dropping nearly 1,000 lbs of

²⁵⁹ Ibid, p. 372.

²⁶⁰ Burns, 'The Story of Ben-My-Chree, Part I', pp. 155-7. Cronin, *Royal Navy Shipboard Aircraft Developments*, pp. 200-1. Hugh & Robin Popham, eds., *A Thirst for The Sea: The Sailing Adventures of Erskine Childers* (London: Standford Maritime Limited, 1979), p. 20.

²⁶¹ Jones, 'Ashore, Afloat and Airborne', p. 46.

²⁶² Ian Burns, 'Woman of My Heart - The Story of Ben-My-Chree, Part II,' in *CCIJ*, vol. 7, no. 1 (Spring 1976), p. 1. Samson, *Fights and Flights*, p. 294.

²⁶³ Burns, 'The Story of Ben-My-Chree, Part II', p. 2.

²⁶⁴ Jones, *WIA*, vol. V, p. 374.

²⁶⁵ Samson, *Fights and Flights*, p. 297.

²⁶⁶ Burns, 'The Story of Ben-My-Chree, Part II', p. 2. Newbolt, *Naval Operations*, vol. IV, p. 207. Jones, *WIA*, vol. V, p. 369.

ordnance over five days.²⁶⁷ The enemy air threat was limited but occasionally could be dangerous, such as when *Raven II* was unsuccessfully bombed by German aircraft.²⁶⁸

After attacking Turkish forces at Jeddah *Ben-my-Chree* returned through Suez, arriving at Port Said on 22 June.²⁶⁹ *Ben-my-Chree* next ran A/S patrols around Suez, conducting 27 flights over ten days.²⁷⁰ *Ben-my-Chree* was able to destroy three contraband runners, schooners, with its gunfire combined with bombing missions from seaplanes, a not insignificant application of naval airpower against enemy merchant shipping.²⁷¹ Very lights and petrol bombs were used to direct spotting missions.²⁷² The carriers struck at will along the coasts, carrying out bombing missions from Port Said to Cyprus by way of Palestine and Lebanon. As was to be expected, improvisation was the rule rather than the exception.

Samson's role ended when *Ben-my-Chree* was caught unaware and destroyed by coastal gunfire near Castelorizo on 7 January 1917 – his greatest error of the war. *Ben-my-Chree* was pummeled by enemy artillery until a shell penetrated the petrol store and burst, setting afire the aft section of the ship.²⁷³ Although Samson was recalled to Britain to command Great Yarmouth, the seaplane carrier work continued in theatre, with Wing Commander C. E. Risk succeeding Samson. HMS *Empress* was sent to replace Samson's flagship and the 7,500 ton HMS *City of Oxford* was sent as a replacement for HMS *Anne*, which, along with *Raven II*, was converted back to merchant shipping in August.²⁷⁴ On 12 May *Empress* sortied from Port Said and successfully bombed Beirut's harbour, but was frustrated in the effort to locate submarines there.²⁷⁵ In October and November 1917 *City of Oxford* worked in conjunction with the monitor HMS *Raglan* to attack the Deir Sineid railway station and bridge with success.²⁷⁶

Another notable achievement was the bombing of *Midilli (Breslau)* and *Yavuz (Goeben)* when they sortied from the Dardanelles on 19 January 1918.²⁷⁷ After sinking the monitors

²⁶⁷ Burns, 'The Story of Ben-My-Chree, Part II', p. 3.

²⁶⁸ Grove, 'Seamen or Airmen?', p. 38.

²⁶⁹ Burns, 'The Story of Ben-My-Chree, Part II', p. 5.

²⁷⁰ Ibid, p. 5.

²⁷¹ Ibid, p. 5.

²⁷² Ibid, p. 3.

²⁷³ Ian Burns, *Ben-My-Chree, Woman of My Heart: Isle of Man Packet Steamer and Seaplane Carrier* (Leicester: Colin Huston, 2008), p. 201.

²⁷⁴ Layman, *Naval Aviation*, p. 155. Layman, *Before the Aircraft Carrier*, p. 76.

²⁷⁵ Flight Commander Brooke aboard HMS *Empress* to Officer Commanding East Indies & Egypt Seaplane Squadron, May 13, 1917, AIR 1/659. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 38.

²⁷⁶ Newbolt, *Naval Operations*, vol. V, p. 78. Hobbs, *Royal Navy's Air Service*, p. 282.

²⁷⁷ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 38.

Raglan and *M28* the two warships were hounded by RNAS and RFC aircraft. *Breslau* received a direct bomb hit and, during its escape, drove into a minefield where both ships struck a series of mines, fatally damaging the light cruiser such that it sank near Rabbit Island.²⁷⁸ *Goeben*, retreating to the Dardanelles, became grounded at Nagara Point and was bombed over several days by seaplanes from HMS *Ark Royal* and *Empress*. 270 sorties and 15 tons of 65 lb and 112 lb bombs were dropped, scoring two hits, and HMS *Manxman* soon arrived carrying torpedo seaplanes to finish the job, but on the 26th, before these were readied for action, the battlecruiser had been refloated and escaped into the Sea of Marmara.²⁷⁹

Despite these successes, in particular the numerous gunfire spotting missions flown against shore-targets and enemy warships in confined waters, it was believed that the Mediterranean successes would not be applicable to the North Sea. Indeed, it was believed that airplanes and kite-balloons operating in this capacity would do more harm than good during fleet action.²⁸⁰ The formation of the EIESS demonstrated the potential of carriers working as part of a group, conducting aerial gunfire spotting on an enlarged scale, and providing the Navy with a mobile striking force that took advantage of the Royal Navy's gunnery and seaplane expertise. The EIESS replicated, in miniature, the larger Grand Fleet effort that began to emerge in late 1917.

The Grand Fleet Air Committee Reforms in 1917

The period after Jutland produced significant changes for the fleet with historic impact on the development of British naval aviation. Jellicoe, First Sea Lord after December 1916, had been succeeded at the Grand Fleet by Sir David Beatty, a commander who believed in taking full advantage of all of the fleet's assets, including the air arm. Beatty was responsible for clarifying the fundamental roles of the RNAS with the fleet, a task he delegated to the able leadership of Rear-Admiral Sir Hugh Evan-Thomas, who was made chairman of the GFAC in February 1917. Beatty also revised the Grand Fleet Battle Orders (GFBO), and with Rear-Admiral Richard Phillimore developed the Grand Fleet Air Orders (GFAO) specifically to instruct the fleet's aircraft and kite-balloons.

²⁷⁸ Kemp, *Fleet Air Arm*, p. 75.

²⁷⁹ Marder, *FDSF*, vol. V, pp. 15-17.

²⁸⁰ Burns, *The RNAS and the Birth of the Aircraft Carrier*, Chapter 10: After Jutland, loc. 2454. Rear-Admiral Hugh Evan-Thomas to Admiral Beatty, Air Requirements of the Grand Fleet, 5 February 1917, AIR 1/648, p. 20.

A year before Beatty's promotion, the DAS Rear-Admiral Vaughan-Lee had written that the primary duty of the RNAS was to take the offensive, with the fleet's aircraft endeavoring '[t]o attack the enemy's fleets, dockyards, arsenals, factories, air sheds, &c., from the *coasts*,' concluding with a plea for the necessity of the Royal Navy specifically focusing on long-distance bombing.²⁸¹ Following the decentralization of July 1915 Vaughan-Lee had allowed local commanders, such as Charles Samson (No. 3 Squadron) in the Mediterranean and Arthur Longmore (No. 1 Squadron) at Dunkirk, to develop their own methods, while the SNOs determined how best to use the RNAS Squadrons. The mixed results of Vaughan-Lee's policy are evident: in particular, establishing a land-based long-range bombing force was not the best method for advancing the RNAS as a component of the fleet proper (see Chapter Five). The boundaries between navy, army and air roles were not always clear, and this state of affairs was in fact exacerbated by the decentralization of the RNAS squadrons to the responsibility of the district SNOs.

The rearmament that began in 1916 continued into 1917, with renewed emphasis placed on the development of the proper equipment for the fleet. In this regard, Admiral Jellicoe's appointment was a watershed moment for the RNAS. Jellicoe, after his promotion to First Sea Lord, was eager to fulfill the air requirements of which he felt the previous administrations had vacillated. Jellicoe promptly replaced Vaughan-Lee on 31 January 1917 and appointed Commodore Godfrey Paine as not only the Director Air Services but also the Fifth Sea Lord.²⁸² Also on the Admiralty Board at this time were the Second Sea Lord, Admiral Cecil Burney, an A/S specialist, whose son was involved in aerial experiments; the air-minded Rear-Admiral Tudor (still Third Sea Lord); and Commodore, as of April, Rear-Admiral, Lionel Halsey (Fourth Sea Lord). Halsey was made Third Sea Lord when Geddes joined as Controller in May, bumping Tudor up to Second Sea Lord.²⁸³ Captain A. Vyvyan, previously a member of the Royal Navy War College Staff, then the Assistant to Chief of the War Staff,²⁸⁴ before he became Sueter's

²⁸¹ Italics in original, Rear-Admiral C. L. Vaughan-Lee, Joint War Air Committee, Extracts from Paper Air 4, dated 3 March 1916, AIR 1/270, #106 in Roskill, *Documents*, p. 310.

²⁸² Jones, *WIA*, vol. IV, p. 4. 'Memorandum as to the functions of the Fifth Sea Lord and Director of Air Services', 14 January 1918. Signed by Admiralty secretary, O. Murray, AIR 1/279.

²⁸³ V. W. Baddeley and Marc Brodie, 'Halsey, Sir Lionel (1972-1949), Naval Officer,' *ODNB*. Marder, *FDSF*, vol. IV, pp. 59-60.

²⁸⁴ *The Naval Who's Who, 1917* (Polstead: J. B. Hayward & Son, 1981), p. 154.

assistant, now stayed on to become Commodore Paine's assistant, while Captain D. T. Norris remained as the assistant for airships.

In May Jellicoe also assumed control of the Naval Staff when David Lloyd George appointed him CNS, shunting Admiral Henry Oliver to Deputy CNS alongside Admiral Alexander Duff, the former head of the ASD, as the Assistant CNS.²⁸⁵ The Prime Minister's reforms forced Jellicoe to expand the staff beyond Jellicoe's usual dual structure (Operations and Material),²⁸⁶ to a triplicate structure (adding Planning), which had implications for naval aviation.

Towards this end in December 1917 at the recommendation of the Director of the Operations Division Rear-Admiral Hope, the Air Division of the staff was proposed. This organisation would pre-empt the creation of the Air Ministry at the beginning of 1918. Like the parent organisation of the RAF, the Air Division was likewise created in January. The Air Division survived the war, and remained a small component of the Naval Staff until 1919 (See Chapter Four).²⁸⁷

Admiral Beatty, formerly the commander BCF and now the C-in-C Grand Fleet, was another boon for the RNAS at sea. Beatty and Jellicoe were both strong advocates for more fleet aviation resources, and were now positioned to develop synergy between the Admiralty, RNAS, and the Grand Fleet, something that had never fully developed during the previous war years. There was work to be done. At the beginning of 1917 the Grand Fleet could rely on only three seaplane carriers and three airship bases.²⁸⁸ The entire Grand Fleet possessed only 24 machines: 12 reconnaissance and 12 anti-Zeppelin fighters.²⁸⁹ In January 1917, to improve the fleet's air capability, Beatty convened the GFAC with Rear-Admiral Hugh Evan-Thomas in the chair.²⁹⁰ The GFAC presented its report on 5 February and Beatty forwarded the report to the Admiralty

²⁸⁵ Black, *British Naval Staff*, p. 192. Marder, *FDSF*, vol. IV, pp. 176-7.

²⁸⁶ Jellicoe, *The Grand Fleet*, Chapter 3, The Staff Organisation, loc. 868.

²⁸⁷ Captain F. R. Scarlett became the first Director of the Air Division in January 1918, followed by Captain R. M. Groves, from October 1918 until August 1919. Black, *British Naval Staff*, p. 249. Robert Marsland Groves, Service Record, ADM 273/2/40, p. 40. Roskill, *Documents*, p. 635 fn. See also, G. Hope, Director Operations Division, Proposed Establishment of an Air Division, 19 December 1917, ADM 1/8508/285.

²⁸⁸ Beatty to Admiralty, 21 January 1917, ADM 1/8475, #158 in Roskill, *Documents*, pp. 460-1.

²⁸⁹ W. R. D. Acland, 'The Development of the Fleet Air Arm,' in *JRUSI*, vol. 79, no. 514 (1934), p. 261.

²⁹⁰ Jones, *WIA*, vol. IV, pp. 4-6. Rear-Admiral Hugh Evan-Thomas to Admiral Beatty, Air Requirements of the Grand Fleet, 5 February 1917, AIR 1/648, p. 20.

two days later, where it was received by Fifth Sea Lord Godfrey Paine, and then circulated during the first week of March.²⁹¹

The report's statement that '...the Air Service so far as it is connected with the Grand Fleet suffers under grave disabilities owing to entire lack of efficient carriers,' provided Beatty with the ammunition he needed to press for expansion. Disconcerting but realistic statistics supplied by Captain Oliver Schwann of *Campania* indicated that, of the 26 aircraft carried aboard the Fleet's carriers, two in five could expect operational failures when deployed.²⁹² Significantly, the report abandoned efforts to develop gunfire spotting, deemed impractical in the rough North Sea weather conditions and unlikely in the midst of the chaos of battle. The GFAC report acted as the catalyst for expanding the fleet's naval aviation, starting with the conversion of HMS *Furious*. The GFAC essentially reintroduced DAS Vaughan-Lee's recommendations, and once again DNC D'Enycourt had to consider what to do with *Furious* and its sister ships.²⁹³ The Admiralty finally decided that *Furious* should be fitted with a launch platform and hanger forward, a project that was estimated to take about 14 weeks, meaning that it would not be ready until the end of May.²⁹⁴

The GFAC report concluded that the essential functions of the RNAS with the fleet were primarily reconnaissance and fleet air defence, expressed in terms of anti-Zeppelin capability.²⁹⁵ The Committee acknowledged the importance of equipping the fleet's carriers with the latest aircraft (Sopwith Baby seaplanes, and Sopwith Pup airplanes), for the purpose of reconnaissance and anti-Zeppelin operations.²⁹⁶ Seaplanes were to be specialized as reconnaissance machines exclusively, the airplane fighters likewise to be specialized for anti-Zeppelin work.²⁹⁷ It is interesting to note that the Committee expected as many as six Zeppelins to operate with the

²⁹¹ 'Air Requirements of the Grand Fleet.' No.299/H.F.0036, from Home Fleet C-in-C to Admiralty, 7 February 1917, AIR 1/648, p 18. Report of Committee on Royal Naval Air Service. (H.F.0036/212 of 26th January 17), AIR 1/648, p. 19. Admiralty notes on Grand Fleet Air Committee Report. 3 March, 1917, AIR 1/648. See also, 'Letter No. 299/H.F.0036 from Admiral Sir David Beatty to the Admiralty from H.M.S. *Iron Duke* dated 7 February 1917, enclosing the Report of the Grand Fleet Committee on Air Requirements' #161 in Roskill, *Documents*, p. 453.

²⁹² Hugh Evan-Thomas to Beatty, Report of Committee on Royal Naval Air Service, H.F.0036/212, 26 January 1917, ADM 1/648, p. 26.

²⁹³ Rear-Admiral Vaughan-Lee to DNC, 11 May 1916, AIR 1/648.

²⁹⁴ Armstrong Naval Yard, High Walker, Newcastle-on-Tyne, to S. V. Goodall, Esquire, 27 February 1917, AIR 1/648.

²⁹⁵ Hugh Evan-Thomas to Beatty, Report of Committee on Royal Naval Air Service, H.F.0036/212, 26 January 1917, ADM 1/648, p. 20.

²⁹⁶ Ibid, pp. 22, 24.

²⁹⁷ Ibid, p. 25.

enemy fleet in a future engagement, recognition of the situation that, due to weather, had been only narrowly avoided at Jutland.²⁹⁸ Beatty's cover letter expressed his endorsement for the Committee's findings, although there was not total agreement: questions remained about the utility of focusing on seaplane carriers when the Navy's airships were nearing completion.²⁹⁹

Another significant outcome of the Committee's report was the recommendation that fighter aircraft should be adapted for service aboard light cruisers. Wing Captain R. M. Groves, Assistant Secretary of the Air Board under Lord Cowdray, was working with Rear-Admiral Phillimore, then at Rosyth aboard his flagship HMS *Repulse*, towards the goal of fitting the cruiser *Yarmouth* with a small flight deck forward. It was from this ship that Flight Sub-Lieutenant B. A. Smart successfully took-off and destroyed Zeppelin *L23* on the morning of 21 August 1917.³⁰⁰ This success promoted further modifications and soon specially designed turn-style launchers were built. These platforms enabled aircraft to launch directly into the wind regardless of the direction the ship was steaming. RN Captain Dumaresq developed the rotating platform, and trials were conducted aboard HMAS *Sydney* starting in December 1917.³⁰¹ At a meeting held in August 1917 between Grand Fleet C-in-C Admiral Beatty and the air minded Third Sea Lord Rear-Admiral Lionel Halsey, it was agreed that in addition to HMS *Courageous* and *Glorious* being fitted with flying-off decks, at least one cruiser from each of the 1st, 2nd, 3rd and 6th light cruiser squadrons should also be fitted.³⁰² Further, Third Sea Lord Halsey, unlike his predecessor Tudor, supported the development of additional fleet carriers.³⁰³ The success of these developments eventually led to all of the fleet's light cruisers, as well as all of the capital ships in the Grand Fleet, being outfitted by the conclusion of the war.³⁰⁴

It is instructive to consider the GFBO for January 1917, the first orders produced under Beatty's tenure. This revised GFBO, which was similar to Jellicoe's previous orders in style and substance, provided only the briefest explanation of the role of seaplane carriers with the fleet, namely, to fly kite-balloons and provide seaplane reconnaissance.³⁰⁵ The fleet in the North Sea,

²⁹⁸ Ibid, p. 23.

²⁹⁹ Ibid, pp. 21-2.

³⁰⁰ Jones, *WIA*, vol. IV, pp. 24-5.

³⁰¹ Ibid, p. 31.

³⁰² Extracts from Minutes of a Conference between Admiral Sir David Beatty, C-in-C, Grand Fleet, and Rear-Admiral Lionel Halsey, 3rd Sea Lord, in August 1917, #186 in Roskill, *Documents*, AIR 1/667, p. 534.

³⁰³ Robbins, *The Aircraft Carrier Story*, p. 42.

³⁰⁴ Jones, *WIA*, vol. IV, pp. 26, 30-1.

³⁰⁵ Seaplane Carriers, Grand Fleet Battle Orders, 5 January 1917, ADM 186/596, p. 45.

and the RNAS with it, had so far followed the GFBO supplied by Jellicoe, followed by the revised Grand Fleet Battle Instructions (GFBI) issued by Beatty.³⁰⁶ Beatty, as Arthur Marder put it, was eager to provide 'a definite role to his aircraft in a fleet action.'³⁰⁷ The new Grand Fleet C-in-C essentially formalized changes that had taken place during the previous year, but not yet been reflected in Jellicoe's orders. The orders issued at the end of January expected to use the fleet's airships (provided by their SNOs through the base commanders at Kirkwall, Longside, and East Fortune) for A/S, surface ship, and anti-Zeppelin reconnaissance, 30 miles in front of the light cruiser screen.³⁰⁸ Although Beatty's orders at this time were reflective of Jellicoe's his thoughts on this matter would clarify after the report of the GFAC in February 1917.

Beatty was now positioned to expand the role of the RNAS, and with Jellicoe installed as First Sea Lord, there was hope that his requests for support would be fulfilled, although Beatty had to make do in the short term with what efforts the fleet itself could muster.³⁰⁹ Priorities in 1917 were divided: the enormous expansion of the RNAS for A/S patrol was destined to consume most of the RNAS resources in 1917: it was estimated that the RNAS required another 800 A/S aircraft plus 200 flying boats that year.³¹⁰

Development of the RNAS with the fleet remained focused on the acquisition of suitable high-speed seaplane carriers.³¹¹ HMS *Nairana* and HMS *Pegasus*, more converted ferries, were added to *Campania*, *Engadine* and *Manxman*, already deployed, although Beatty believed more needed to be done.³¹²

On 20 July Sir Edward Carson was replaced by Sir Eric Geddes as First Lord of the Admiralty.³¹³ Geddes was quick to grasp the importance of Jellicoe's reforms and convened an Operations Committee on aircraft, including Jellicoe, Admiral Wemyss (Jellicoe's deputy), the Director ASD Captain William Fisher, Deputy Chief of Staff Rear-Admiral Oliver, and significantly, Fifth Sea Lord Paine. This development highlighted the extent to which the Air

³⁰⁶ Selections from Grand Fleet Battle Instructions, 1 January 1918, #252 in, Bryan Ranft, ed., *The Beatty Papers*, vol. I, (Brookfield: Gower Publishing Company, 1989), pp. 456, 481. Also NMM BTY/7/3/4, and the Grand Fleet Battle Instructions, January 1, 1918, ADM 137/4055.

³⁰⁷ Marder, *FDSF*, vol. IV, p. 37.

³⁰⁸ Airship Instructions, Grand Fleet Battle Orders, vol. II, 24 January 1917, ADM 116/1342, p. 416

³⁰⁹ Stephen Roskill, *Admiral of the Fleet Earl Beatty: The Last Naval Hero* (New York: Antheneum, 1981), pp. 214-5.

³¹⁰ Jones, 'Ashore, Afloat and Airborne', p. 38.

³¹¹ RNAS Policy and Development, Paine reply, 30 January 1917, ADM 1/8478/10, p. 2.

³¹² Redford and Grove, *The Royal Navy*, p. 96. Acland, 'The Development of the Fleet Air Arm' p. 261.

³¹³ Rodger, *The Admiralty*, p. 121.

Department's functions were being incorporated into the Naval Staff, and indeed the Air Division of the Staff was presently formed by Geddes and the newly appointed First Sea Lord Admiral Wemyss in January 1918.³¹⁴ The July 1917 Operations Committee, for its part, essentially pursued Captain Vyvyan's August recommendations (see below), and in October 1917 determined that fighting aircraft should be added to all of the fleet's cruisers and battlecruisers.³¹⁵

On 23 August Jellicoe produced a memorandum that again endorsed the GFAC report, in addition to the Operations Committee's position. Jellicoe's stated policy provided: (1) airships as fleet scouts - he still believed that they would be as useful as new light cruisers; (2) kite-balloons and non-rigid airships for gunfire spotting, tactical reconnaissance, and ASW in terms of coastal patrol flotillas, and convoys; (3) seaplanes capable of roles such as fighting, spotting and reconnaissance, and, (4) aircraft to fulfill all other roles such as countering the enemy's aircraft or conducting aerial torpedo attacks.³¹⁶ Noting the inability of the Navy to set out a clear policy after three years of war, Jellicoe expected delays in the effort to achieve his objectives.

Captain Vyvyan, still the Assistant to the Director Air Services (ADAS), only two days after the appearance of Jellicoe's missive, produced a memorandum on 30 August for the consideration of the Fifth Sea Lord. Vyvyan's appreciation of the air situation, combined with Jellicoe's letter, provided a one-two punch acting as a wake-up call for the development of fleet air support. Vyvyan argued that only the recently converted light cruisers, plus *Furious*, were fast enough to work with the fleet and thus all the converted seaplane carriers were insufficient. Vyvyan's appreciation was certainly true enough in terms of keeping up with the battlecruisers, but not entirely accurate in so far as operations with the fleet were concerned: even the slower carriers could provide a useful function as seaplane tenders and recovery vessels, and indeed the ADAS now proposed exactly this role for *Argus* (when finished), *Engadine*, *Empress* and *Riviera*. For work with the fleet Captain Vyvyan advocated three classes of aircraft: reconnaissance machines, fighters, and a torpedo - and bomb - carrying aircraft, for which he

³¹⁴ Black, *British Naval Staff*, p. 249.

³¹⁵ Jones, *WIA*, vol. IV, p. 30fn.

³¹⁶ 'Appendix I: Admiralty Memorandum on Naval Air Policy' 23 August 1917, in Jones, *WIA*, vol. IV.

believed the optimum platform would be more fast *Cavendish*-type carrier conversions (*Cavendish* became HMS *Vindictive* following the Zeebrugge raid).³¹⁷

In terms of aircraft tactics, Vyvyan's outline program was sound and indeed formed the basis for what would become the GFAO later in 1918. Essentially, Vyvyan imagined a wave of reconnaissance machines flying ahead of the fleet that, upon encountering the enemy's aircraft or Zeppelins, would communicate back to the fleet by W/T, prompting the fleet to launch its fighters. The reconnaissance machines would meanwhile patrol for enemy submarines, although Vyvyan recognized that their W/T function would be almost totally diminished by the general radio traffic produced during battle. *Argus*, now under the command of Captain Nicholson, would deploy torpedo-airplanes that then would proceed to attack the enemy in a spoiling attack as a prelude to the general fleet battle.³¹⁸ The RNAS now had a definitive role with the fleet as a core element of engagement-battle tactics.

To summarize Vyvyan's proposal: *Furious*, *Cavendish*, and the forthcoming *Hermes*,³¹⁹ would provide the principle reconnaissance and anti-Zeppelin platforms.³²⁰ Fighters would be dispersed on a variety of light cruisers, including *Glorious* and *Courageous*, while *Campania* would be converted to a training ship.³²¹ Enemy aircraft would be attacked by the cruisers' aircraft once sighted. *Argus*, positioned with the battleships, after launching its strike component of up to two dozen torpedo-planes would act as a refueling and recovery station.³²²

By this point in the war with the functions and tactical roles of the fleet's aircraft established, it was now apparent that the major technical hurdle was the development of improved take-off and landing capability. A Committee on Deck Landing was thus created at the Air Department on 22 November 1917, and its preliminary report was out by 17 December.³²³ The committee was composed of veteran airmen, including Vyvyan, Wing Commander Longmore, Wing Commander Courtney, Squadron Commander Bustead and Squadron

³¹⁷ Memorandum dated 30 August 1917 by Captain A. V. Vyvyan 'For Director of Air Services' addressed to 5th Sea Lord, and Minutes by Rear-Admiral G. Paine, 5th Sea Lord, and Vice-Admiral H. F. Oliver, D.C.N.S., AIR 1/667 and ADM 1/8436, #188 in Roskill, *Documents*, pp. 536-41.

³¹⁸ *Ibid*, pp. 539-40.

³¹⁹ The *Hermes* plans were approved in April 1917, to be designed by Charles J. W. Hopkins, who had assisted John H. Narbeth, the Assistant Director of Naval Construction and principal designer, with HMS *Eagle*. Pulsipher, 'Aircraft and the Royal Navy, 1908-1918,' p. 237. Layman, 'HMS Ark Royal', p. 147.

³²⁰ ADM 1/8436 and AIR 1/667, in Roskill, *Documents*, p. 537.

³²¹ *Ibid*, pp. 537, 539.

³²² *Ibid*, pp. 537, 539-40.

³²³ Committee on Deck Landing, Preliminary Report, 17 December 1917, AIR 1/662.

Commander Rutland plus Flight Commander Penney and Commander Holmes. ACA Phillimore, then aboard HMS *Repulse*, was also involved. The Committee's experimental work had been carried out at the Isle of Grain depot, with the result that navalized Sopwith Camels and Pups were in development and fitted with the appropriate skids, release gear, and floatation devices. At this time it was planned to place seven airplanes aboard *Campania*, 14 in *Furious* by the end of February 1918, 20 in *Argus*, with another six in *Cavendish*, then under conversion and slated for completion in May of 1918 although not actually completed until October.³²⁴

Admiral Jellicoe left the Admiralty on 26 December 1917 over controversy related to the conduct of the A/S campaign and amid rumors regarding his health.³²⁵ The new First Sea Lord, Admiral Sir Rosslyn Wemyss, produced a memorandum on 16 January 1918 that was demonstrative of the incoming administration's intention to follow through with previous recommendations, notably those made by Captain Vyvyan, endorsed by Admirals Beatty and Jellicoe. The Operations Committee now concluded that fighters should be carried aboard all fighting ships, and that the seaplane carriers *Pegasus* and *Nairana* should be modified to carry fighters. The proposal recommended converting *Campania* into a training ship, as well as the prospective conversion of the former Chilean battleship *Almirante Cochrane* into the aircraft carrier HMS *Eagle*.³²⁶ This meant that there were four large carriers under construction or conversion at the beginning of 1918: *Eagle*, *Hermes*, *Argus* and *Vindictive*. Once joined with *Furious* this would comprise the most powerful naval aviation striking force anywhere in the world.

The stage was now set for the culminating developments of the war. Although the late summer and fall of 1917 had seen the development of the most comprehensive air policy to date for the RNAS, it was also the same period in which the second Smuts' report appeared, making inevitable the creation of the Air Ministry and thus the merger of the RFC and RNAS into a single service. The Royal Navy seemed poised to match longstanding theory to material reality, yet was on the verge of losing control over the RNAS altogether.

³²⁴Ibid, p. 4. Director of Naval Construction Tennyson D'Eyncourt, Aircraft Carriers, part I, January 1919, NMM DEY/95, p. 7.

³²⁵ Stephen Roskill, 'The Dismissal of Admiral Jellicoe,' in *The Journal of Contemporary History*, vol. 1, no. 4 (October 1966), pp. 69–93.

³²⁶ Jones, *WIA*, vol. IV, pp. 31–2.

Rear-Admiral Phillimore, Admiral Commanding Aircraft, and the Flying Squadron

The formation of the Flying Squadron stands out as the final achievement of the RNAS in its development with the fleet. This significant and concrete move by Admiral Beatty to improve the fleet's air capability came amidst a battery of changes that occurred during the summer and fall of 1917. Admiral Beatty on 24 September 1917, with the Admiralty and Air Department appreciations already released, reviewed the question of aircraft and seaplane carriers and recommended improvements 'separate and distinct' from the planning then underway for the proposed Wilhelmshaven torpedo strike.³²⁷ Beatty outlined a 1918 air arm requirement of 15 reconnaissance, 30 torpedo and 50 fighting machines.³²⁸ The Grand Fleet C-in-C had already taken the step of introducing a seaplane carrier group in his GFBOs for 22 July, the squadron at that time comprised of *Campania*, *Engadine*, *Vindex*, *Nairana* and *Pegasus*.³²⁹

Two days after the Second Battle of Heligoland Bight on 19 November 1917, Beatty proposed the establishment of the ACA position, initially known as the Rear-Admiral (A), to act as a flag rank 'adviser and deputy' of the C-in-C on all aerial matters.³³⁰ The ACA's responsibilities encompassed all of the aircraft, carriers and naval air stations operating with the Grand Fleet.³³¹ The seaplane carrier squadron would be renamed the Flying Squadron, for which Beatty proposed HMS *Furious*, then undergoing refit, as the flagship.³³²

Selected for this unique task was Rear-Admiral Richard Phillimore, a long-standing battlecruiser commander – he had captained HMS *Inflexible* at the Falkland Islands – and a convert to naval airpower. Phillimore's appointment provided Beatty with an aviation safeguard to prevent the Air Ministry assuming complete control over the Grand Fleet's aviators and aircraft. The ACA would be responsible 'for the efficient training of personnel and upkeep of

³²⁷ 'Letter No.2353/H.F. 0036 of 24 September 1917 from Admiral Sir David Beatty, C-in-C, Grand Fleet, to the Admiralty entitled "Aircraft Requirements of the Grand Fleet"', ADM 1/8486, #192 in Roskill, *Documents*, p. 547.

³²⁸ Ibid, p. 546.

³²⁹ *Stockholm* was the original name of the seaplane carrier *Pegasus*, formerly a cargo and passenger steamer being built for the Great Eastern Railway and completed as a 21 knot seaplane carrier in September 1917. Admiral Beatty, Grand Fleet Battle Orders, 22 July 1917 & 5 September 1917, ADM 116/1342, pp. 439, 441. Burns, *The RNAS and the Birth of the Aircraft Carrier*, Chapter 10, loc. 2315. Director of Naval Construction Tennyson D'Eyncourt, Aircraft Carriers, part I, January 1919, NMM DEY/95 p. 10.

³³⁰ Beatty to Admiralty, 19 November 1917, ADM 1/8504, #207 in Roskill, *Documents*, p. 586.

³³¹ Admiral Beatty, Appointment of Flag Officer for Command of Seaplane Carriers etc. of the Grand Fleet, 19 November 1917, ADM 1/8504, #207 in Roskill, *Documents*, pp. 586-7.

³³² Ibid, p. 586. For the complete operations of HMS *Furious* while flagship of the Flying Squadron see Appendix 2: HMS *Furious* Operations, 1917 and 1918 in Burns, *The RNAS and the Birth of the Aircraft Carrier*, ADM 137/876 & ADM 137/877.

materiel, and would superintend all experiments, trials and practices of Aircraft' - a broad mandate indeed.³³³ For the remaining short life of the Air Department the ACA would report to the Fifth Sea Lord and thus Phillimore would act as a liaison between Beatty concerning 'principle or policy' and the Air Department itself.³³⁴ Beatty was informed on 6 January 1918 that the Admiralty had approved his proposal and, furthermore, that the RNAS was soon to be transferred to the newly established Air Ministry.³³⁵ The creation of the Admiral Commanding Aircraft and the Flying Squadron was thus a long overdue development, yet also the final stop gap regarding the question of control of the 'Air Force Contingents' that would soon be operating with the Grand Fleet.³³⁶ All RAF naval aviation personnel would fall under the ACA's command and thus the C-in-C Grand Fleet's authority.³³⁷ Beatty had managed to keep the Grand Fleet's RNAS officers under his nominal command, despite their official transfer to the RAF on 1 April 1918.

In March 1918 the modifications to HMS *Furious* (new aft landing deck and hanger) were completed and Phillimore moved his flag to the carrier.³³⁸ Phillimore's SFO was Lieutenant-Colonel Richard Bell Davies, Wing Captain Elder's deputy from the No. 3 Wing days, with Lieutenant-Colonel R. H. Clark-Hall, of HMS *Ark Royal*, as chief of staff.³³⁹ Twelve trial landings were made between March and May 1918, leading to the conclusion that a flush deck should be added in future, with the superstructure moved to the starboard or removed all together, as in the case of *Eagle* and *Argus* respectively.³⁴⁰

ACA Phillimore and Grand Fleet C-in-C Beatty agreed that the airplane was now more than simply a useful auxiliary but in fact another vital instrument of naval power, capable of extending the range and utility of cruiser reconnaissance, improving gunfire accuracy, protecting the airspace above the fleet, and indeed, conducting its own unique torpedo and bomb attacks. Based on the lessons learned from the Tondern raid, Beatty put Phillimore and his RAF staff to work at developing an airplane 'suitable for carrying in H.M. Ships for reconnaissance and

³³³ Roskill, *Documents*, p. 586.

³³⁴ Beatty's draft of the ACA functions, 29 December 1917, ADM 1/8504.

³³⁵ The creation of the RAF had been decided upon at the War Cabinet meeting of 24 August 1917. Roskill, *Documents*, p. 587. Cooper, *Birth of Independent Air Power*, p. 104; Jones, *WIA*, vol. VI, p. 13.

³³⁶ Roskill, *Documents*, p. 587. Marder, *FDSF*, vol. IV, pp. 332-3.

³³⁷ Beatty draft of ACA functions, 29 December 1917, ADM 1/8504.

³³⁸ Jones, *WIA*, vol. IV, p. 34.

³³⁹ Bell Davies, *Sailor in the Air*, p. 172.

³⁴⁰ Director of Naval Construction Tennyson D'Eyncourt, Aircraft Carrier, part I, 1918, NMM DEY/95, p. 7.

spotting purposes.’ The ACA submitted the technical report to the C-in-C and Beatty, with his additional comments, forwarded the report to the Admiralty on 11 August.³⁴¹

The state of affairs at the end of the war is encapsulated by the GFAOs, specifically providing the Flying Squadron and its aircraft with roles in a holistic fashion that represented the codification of four years of wartime learning.³⁴² In addition to these general rules the instructions issued after the armistice on 25 November included a specific section on the ‘Duties of the Flying Squadron and its Planes.’³⁴³

The instructions described an integrated system, including airships for advanced reconnaissance, anti-mine and ASW elements. Airplanes would also provide reconnaissance and fighter defence.³⁴⁴ Gunfire spotting, by aircraft and kite-balloons, had also been brought to a high degree of sophistication. In the final iteration of the fleet’s air orders, the ‘Instructions for Aircraft’ issued as part of the GFBI of 25 November, the orders built upon the March 1918 orders and provided thorough details on the employment of kite-balloons for gunfire spotting and reconnaissance, with mandated parachutes, for example, and airplanes required to carry flares for signaling hits or misses, in case their wireless apparatus were to fail.³⁴⁵ Admiral Beatty expected at least four aircraft to fly close reconnaissance of the enemy battle-line, with a fifth aircraft screening for the battle cruisers.³⁴⁶ The instructions acknowledged the ever-present issue of weather, and thus that aircraft were still ‘supplementary to, and not a substitute for,’ the fleet’s cruiser screen, a recognition of the transitional nature of fleet air power during the First World War.³⁴⁷

Conclusion

The Air Department, as initially led by Captain Sueter and supported by First Lord of the Admiralty Churchill, appreciated naval aviation as a revolutionary military force with vast potential for the future of naval and indeed land warfare. There were certainly contrasts in style

³⁴¹ Beatty to Admiralty, 11 August 1918, AIR 1/643, #265 in Roskill, *Documents*, p. 699.

³⁴² Admiral David Beatty, Grand Fleet Air Orders, 14 March 1918, ADM 137/401.

³⁴³ Grand Fleet Battle Instructions, November 25 1918, ADM 137/4055, p. 18.

³⁴⁴ Grand Fleet Battle Instructions, Instructions for Aircraft, 1 January 1918, ADM 137/4055, p. 17. See also, ‘Grand Fleet Battle Instructions’, Instructions for Aircraft, 1 January 1918, ADM 116/1342, pp. 19-20.

³⁴⁵ Grand Fleet Air Orders, 14 March 1918, ADM 137/401, pp. 8, 12. Grand Fleet Battle Instructions 1918, November 25 1918, ADM 137/4055, p. 17.

³⁴⁶ Grand Fleet Battle Instructions, Instructions for Aircraft, 1 January 1918, ADM 137/4055, p. 19.

³⁴⁷ *Ibid*, p. 20.

and approach. Churchill envisioned the RNAS to be a mobile strike force, a military branch of the Royal Navy, whereas Admiral Jellicoe, when appointed C-in-C Grand Fleet, perceived aircraft and airships as auxiliaries of the fleet, chiefly with the expectation that the RNAS would aid the fleet's gunnery and reconnaissance. Technical limitations, combined with the variable pace of operational learning, resulted in the fleet leadership struggling to provide adequate air support for much of the war. Indeed, one of the most significant criticisms leveled against the Air Department, and the Admiralty leadership, was a failure to take seriously the role of aircraft with the fleet.³⁴⁸

The demand for material was incessant, and it was in part the ever-increasing expense of acquiring new aircraft and more powerful engines that drove the government to transfer aircraft supply first to the Ministry of Munitions and then to the Air Ministry. It is also worth considering that the requirement that the RNAS supply squadrons to the BEF, as was necessitated in January 1918 when seven Dunkirk squadrons were transferred to Field Marshal Sir Douglas Haig's command, demonstrated that the legacy of the unified RFC cast a long shadow over the history of the RNAS.³⁴⁹

The seaplane and kite-balloon gunfire spotting experiences of 1915 were particularly significant for several reasons. First, the need for the balloons and their balloon ships was an indication of the technological immaturity of the seaplane for gunfire spotting. Second, the adoption of balloons by the Air Department provided an example of the organisation's flexibility, indeed, the quick integration of balloons into the fleet, followed by their replacement by non-rigid airships and then airplanes and flying boats, provides a case-study in terms of wartime technical adaptation. Lastly, like the Navy's efforts to develop airships, the development of naval gunfire spotting produced outcomes that were dramatically different from expectations. The exposure of the new technology to wartime friction produced a flurry of innovation that by the end of the war had reached a degree of general competency that was not reached again until well into the Second World War.

The first highly centralized and non-fleet focused phase of the Air Department's existence, from the start of the war until the May Crisis of 1915, transitioned to the decentralized re-armament phase of the second half of 1915 through much of 1916. Under First Lord of the

³⁴⁸ Pulsipher, 'Aircraft and the Royal Navy', p. 359.

³⁴⁹ Jones, 'Ashore, Afloat and Airborne', p. 43.

Admiralty Balfour this phase promised to make the RNAS more naval in character, but progress was again diverted by a number of changing wartime priorities, with the fleet invariably suffering. The lessons of the RNAS experience with the fleet during the First World War are clear: pre-war theory, although sound and in many cases visionary, did not adequately prepare the RNAS for the role it would play during the war. Likewise, the strategic planning of Churchill and Balfour, although put into practice with some initial success, failed to provide the fleet with the naval aviation capability it actually required. As a result of this scattering of resources, administrative reshuffling, and technical limitations, little had been done in terms of fulfilling the requirements of the Grand Fleet prior to 1917.

The third phase began at Jutland when the limitations of the RNAS to operate with the fleet were exposed in battle. This experience rejuvenated the fleet's aviation, commencing a long succession of reforms that culminated in 1918 when the Grand Fleet emerged with airplanes integrated into its fabric as part of a total system. The formation of the 1917 War Cabinet under former Minister of Munitions and War Minister David Lloyd George profoundly influenced the future of the RNAS in this regard, as did David Beatty's promotion to Grand Fleet C-in-C. The selection of Admiral Jellicoe as First Sea Lord commenced a year-long period of rapid improvement, although Jellicoe's dismissal also heralded the formation of the Air Ministry.

The Royal Navy thus lost control of the Air Department and when the RNAS merged with the RFC on 1 April 1918, the situation had in some ways returned to the pre-war days of a unified service. All that remained at the Admiralty was the vestigial Air Division of the Naval Staff, along with the kite-balloon and airship sections. The Grand Fleet, thanks to Beatty's promotion of Phillimore and the creation of the Flying Squadron, for the remainder of the war could at least count on the integrity of its airmen and vessels. The actual impact of this administrative decision was not immediately apparent, however, considering the legacy of inter-service cooperation between the RFC and RNAS during the war. It was the beginning of what would prove to be a hundred years of controversy that indeed continues to this day.³⁵⁰

³⁵⁰ Future Distribution of Aircraft Carriers, 2 February 1919, ADM 1/8550/28. See also, 'C.B. 973. Naval War Manual' Naval Staff, Training and Staff Duties Division, 1925 October, ADM 186/66, p. 49-58. 'From Rear-Admiral R. F. Phillimore' 25 January 1919, NMM BTY 13/30/2, reproduced as #6 in Bryan Ranft, ed., *The Beatty Papers*, vol. II, (Brookfield: Ashgate Publishing Company, 1993), pp. 19-21. Grove, 'The Naval Aviation Controversy 1919-1939'. Eric Grove, 'The Discovery of Doctrine. British Naval Thinking at the Close of the Twentieth Century,' in *The Development of British Naval Thinking*, ed. Geoffrey Till (New York: Routledge, 2006), p. 183.

Chapter Four: Anti-Submarine Warfare

The RNAS was significantly involved in the campaign to defeat Germany's U-boats: the greatest threat to Allied victory in the First World War. The RNAS contribution to the suppression and defeat of the U-boats was based on a threefold approach. First, naval aircraft provided continuous patrol over the North Sea, Mediterranean, and Atlantic approaches, searching for submarines and preventing their unhindered access to the surface. Second, RNAS bombers directly attacked the submarine bases along the Belgian coast at Ostend, Zeebrugge, and Bruges. Third, RNAS flying boats, seaplanes and airships provided air cover for the merchant shipping convoys that in turn protected British and Allied shipping from U-boat assault. This chapter explores the first and third of these roles, the bombing campaign against Germany's submarine bases from RNAS Dunkirk is discussed in Chapter Five.

Airships, aircraft and kite-balloons all acted as a deterrent towards preventing submarine attack, first, by uncovering the submarine's location, and second by threatening counterattack, forcing the submarine to submerge and thus run on its limited batteries. The large scale 'Spider Web' patrols, implemented first in the spring of 1917 at Felixstowe NAS under SNO Harwich, reduced the submarine's effectiveness further. With the introduction of convoys, escorted by RNAS aircraft and airships, the submarines were finally brought to heel. Merchant ship convoys forced the raiding U-boats to attack well protected surface flotillas, defended not only by destroyers and other escorts, but also by kite-balloons, airships and seaplanes. Supported by air cover, the convoys provided Allied merchant shipping with protection that the U-boats could challenge only at their peril.¹ Indeed, there were only eight cases in which U-boats dared to attack a convoy protected by both air and surface craft. Airships capable of persistent support, in waters free from enemy fighter aircraft, were even more successful.²

The use of airplanes to combat the submarines had been the subject of debate and research in the pre-war period. Between 1912 and 1914 a group of undersea warfare specialists in the Royal Navy, Royal Marines and Naval Wing, theorized that aircraft would play an important role in ASW. Experiments were carried out to determine if aircraft could successfully locate and attack enemy submarines, while the establishment of coastal air stations and airship

¹ Tim Benbow, *Naval Warfare 1914-1918*, Kindle ebook (London: Amber Books Ltd, 2011), chapter 6, loc. 3177.

² Abbatiello, 'British Naval Aviation', pp. 107-8. Abbatiello, *Anti-Submarine Warfare*, p. 112.

sheds enabled the first routine aerial coastal patrols. The impression held after the First World War that, little had been done by the Royal Navy to prepare for ASW is not entirely correct, although it is fair to note that efforts were still in the experimental stage when the war began.³

The start of the war caused a tremendous disruption to the organisation and mission of the RNAS. Resources were transferred away from the home front and North Sea, first to the Belgian coast, and then to the Dardanelles. During this initial phase of the war, when the RNAS was also responsible for defending London from Zeppelin attack, German submarines quickly emerged as a threat to the fleet's warships. The loss of HMS *Pathfinder*, *Cressy*, *Hogue*, *Aboukir*, *Formidable*, *Hawke*, and the seaplane carrier *Hermes*, all within the first six months, testified to the reality of the danger. Germany's overseas squadrons and merchant raiders, however, were soon destroyed or bottled-up, leaving the submarine to fill the gap as a merchant raider. Germany declared a war zone around Britain in February 1915.

In this first phase of unrestricted submarine war the deterrent effect of warnings from the United States, after the sinking of *Lusitania* by *U20* in May and *Arabic* in August, were enough to prompt the German High Command to rein in the U-boats, at least until 1916. The process was then repeated in February 1916 when unrestricted operations resumed, but were then again curtailed following the torpedoing of the *Sussex* by *UB29* in March 1916.⁴ Enemy submarines sank just over a million tons of British shipping by May 1916.⁵ This was a real threat, although manageable. Diplomatic pressure was initially sufficient to prevent Germany's submarines from inflicting catastrophic losses on Britain's shipping, while new construction made good on incurred losses. The monthly loss rate remained tolerable, and as a result, and without suitable seaplanes, airplanes and airships, ASW did not feature highly amongst the Air Department's priorities.

The inability of the High Seas Fleet to defeat the Grand Fleet during the Battle of Jutland, followed by the likewise unsuccessful August sortie of Admiral Reinhard Scheer, necessitated a new naval strategy, one that Chief of the German Naval Staff Admiral von Holtzendorff was eager to pursue: a renewal of unrestricted submarine warfare as the best chance to defeat Britain

³ W. S. King-Hall, 'The Influence of the Submarine in the Naval Warfare of the Future,' in *JRUSI*, vol. 64, no. 455 (August 1919), p. 364.

⁴ Gibson and Prendergast, *German Submarine War*, pp. 85-6. Marder, *FDSF*, vol. II, pp. 346-7.

⁵ British Merchant Vessels Lost by Hostile Action, August 1914 – May 1916, CAB 42/15/16.

in 1917.⁶ The inadequacy of the Royal Navy's initial response to the German submarine campaign was now exposed by the systematic destruction of Britain's merchant shipping. Allied and neutral shipping losses began to rise again in October 1916 when over 300,000 tons were sunk, twice the figure for the preceding month. The situation remained tolerable until February 1917 when over 500,000 tons were sunk, a loss rate that continued to increase and reached 600,000 in March before the wartime high of 850,000 tons in April, the largest monthly shipping loss rate in either World War.⁷

Britain built or acquired about 500,000 tons of new shipping, plus another 131,000 tons from the Empire, during the first six months of 1917.⁸ Of the three million tons of Allied shipping destroyed between January and July, 1.4 million tons were British. Thus the Admiralty needed to account for a deficit of 769,000 tons by the beginning of July.⁹ The threat was serious, although relative. As the height of the crisis was being reached, new methods and equipment were introduced to staunch the sinking rate. Only 140 large merchant ships were actually required each week to supply the war effort,¹⁰ and in 1914 the Empire accounted for about 12,440,000 tons of shipping, almost half the global supply.¹¹ By the end of 1917 three million tons of shipping had been built since the start of the war, with another 780,000 tons captured from the Central Powers. The American declaration of war in April 1917 helped to reduce the pressure, adding new tonnage while also releasing warships from the Grand Fleet to act as escorts.

Still, loss rates had to be curtailed. With the crisis at its peak the Admiralty reshuffled the Naval Staff and Sir Eric Geddes was appointed as overall Shipping Controller with responsibility for all naval and merchant shipping. Jellicoe became not just First Sea Lord but now also CNS, while the measures implemented by Jellicoe since January 1917 began to produce a cumulative effect, slowly curbing the U-boat's effectiveness. RNAS aircraft played an important role,

⁶ John Keegan, *The First World War*, Vintage Canada (Toronto: Random House of Canada Ltd., 2000), pp. 352-3. Benbow, *Naval Warfare*, chapter 6, loc. 3003.

⁷ Rossano, *Stalking the U-Boat*, p. 2. Redford and Grove, *The Royal Navy*, p. 81. See also, Fig. 6.2. British, Allied and neutral merchant ship losses by cause, September 1939 – May 1945, in Redford and Grove, p. 170.

⁸ Marder, *FDSF*, vol IV, p. 65.

⁹ Appendix E: Submarine Warfare in Home Waters, February 1917 to October 1918, in Newbolt, *Naval Operations*, vol. V, p. 424.

¹⁰ Benbow, *Naval Warfare*, Chapter 6, Loc. 3169.

¹¹ Richard Woodman, 'The Problems of Convoys, 1914-1917,' in *Dreadnought to Daring*, p. 53.

alongside the new armed merchant ships, decoy vessels, expanded minefields and other methods of collecting and disseminating information.

Ultimately it was the introduction of merchant convoy and escort that resolved the crisis. Convoys had already been implemented in a few select districts as experiments and their general introduction was gaining support from members of the fleet, the Naval Staff, the Ministry of Shipping, and the Prime Minister's office.¹² Opposition mainly came from the Admiralty, in particular from Jellicoe's support staff, notably Admirals Duff and Oliver, who persisted in their belief that the prohibitive escort requirements and delays involved would make the implementation of convoy too great of a risk.¹³

Without labouring the issue, it can be said that the logic of convoy was ultimately irrefutable, all criticism eventually being found to be either specious or based on erroneous data. With convoy adopted generally after June 1917, alongside the greatly expanded countermeasures for which Jellicoe was primarily responsible, shipping losses began to decline. By September only 350,000 tons were lost and it became clear that the crisis had been surmounted. Losses remained steady at this level, nevertheless, until the final months of the war, suggesting that the submarine threat was never truly defeated, although it was successfully contained.¹⁴

The RNAS acted alongside the RN to provide escort and A/S capability for the convoys. The convoys themselves were supported by attached aircraft, blimps and balloons which were to provide long-range and close-in submarine and torpedo warning. Alongside the escort role, a vast combination of non-rigid airships, flying boats, seaplanes and airplanes continued the RNAS air patrol mission. Thousands of hours of A/S patrols were flown over the North Sea, Atlantic approaches and Mediterranean, contributing to the increased frustration of the U-boat commanders, and on a few occasions, resulting in successful sinkings.

The experience gained was eventually compiled by the Naval Staff and published, beginning with a series of detailed manuals meant for pilot and observer training purposes. As with other RNAS roles, ASW began as pre-war theory before evolving into a core component of the total merchant protection and A/S system of 1917-1918. This system was so significant for the Navy's conduct of the war that the Air Division of the naval staff, established in January

¹² Marder, *FDSF*, vol. IV, pp. 118-9.

¹³ Marder, *FDSF*, vol. IV, pp. 120-1.

¹⁴ Fig 3.3, British, Allied and neutral merchant vessels destroyed by enemy action, 1 June 1916 - 31 October 1918, Redford and Grove, *The Royal Navy*, p. 81.

1918, was primarily concerned with ASW and an additional Air Section was also established at the staff's ASD. When the RAF was formed on 1 April 1918 the third service inherited the Air Department's highly evolved A/S system, by then organised into large air groups for patrolling the coastlines and protecting merchant convoys.

Aircraft Against Submarines: Prewar Theory

The Naval Wing of the RFC experienced a flurry of theoretical and experimental innovation in the two years preceding the July crisis of 1914. This was a pioneering era in which progress was made against a backdrop of setbacks and reversals. The first experiments in which aircraft played an A/S role were the result of First Sea Lord Admiral Sir John Fisher's secret A/S committee, formed in late 1909, and then expanded by Fisher's successor, Sir Arthur Wilson. The committee, using the destroyer HMS *Crusader* as a base, conducted trials with airplanes detecting and attempting to bomb submarines.¹⁵ The committee had planned to develop airplane bombs specifically for A/S purposes, however, the limited horsepower, and thus, lifting capacity, of pre-war aircraft made this a futuristic proposition.¹⁶

As far as ASW was concerned the Royal Navy had every reason to expect success from the Naval Wing. DAD Sueter was himself a specialist in submarine and mine warfare, and had published several works on the subject.¹⁷ In an Air Committee report for August 1912, Sueter listed, '[a]ssisting destroyers to detect and destroy submarines', as a fundamental duty of naval aircraft.¹⁸

Lieutenant Hugh Williamson was another of the influential submarine, torpedo, and mine warfare practitioners who readily adopted flight as an instrument of naval power. Williamson earned his pilot's certificate in 1911, and then attended the CFS in September 1913.¹⁹ In 1912

¹⁵ Nicholas Lambert, *Sir John Fisher's Naval Revolution* (Columbia, South Carolina: University of South Carolina Press, 2002), p. 210.

¹⁶ W. D. Hackmann, 'Burney, Sir (Charles) Dennistoun, Second Baronet (1888-1968), Marine and Aeronautical Engineer,' *ODNB*.

¹⁷ Murray Sueter, *The Evolution of the Submarine Boat, Mine and Torpedo, from the Sixteenth Century to the Present Time* (London: J. Griffin and Company, 1907). Murray Sueter, 'ESSAY. Third Place. Subject:- "In the Existing State of Development of War-Ships and of Torpedo and Submarine Vessels, in What Manner Can the Strategic Objects, Formerly Pursued by Means of Blockading an Enemy in His Own Ports, Be Best Attained?,"' in *JRUSI*, vol. 48, no. 2 (July 1, 1904), p. 757.

¹⁸ Abbatiello, *Anti-Submarine Warfare*, pp. 83-4. Abbatiello, 'British Naval Aviation', p. 132. Extracts from Paper by Captain Murray Sueter, Director of Air Department, Admiralty, dated 29 August 1912, AIR 1/652, #18 in Roskill, *Documents*, pp. 56-60.

¹⁹ Abbatiello, 'Doctrinal Innovation in the Royal Naval Air Service', p. 35.

Williamson produced an important memorandum that explored the possibilities of using aircraft for ASW.²⁰ Williamson's report arrived at the Admiralty on 22 January 1912.²¹ Therein, Williamson described a 20 knot parent ship that would transport submarine hunting aircraft, capable of launching flights of two to four seaplanes that could then search nearby waters, looking for periscopes or submarines laying on the surface. Once a submarine had been spotted, the A/S aircraft would return to the parent ship to report. From that point, further aircraft armed with bombs would conduct attacks and nearby destroyers would be contacted to target the submarine.²² Williamson had hit upon the significant point that aircraft could exert pressure on submarines simply by forcing them to submerge, thus draining their batteries and denying them access to the surface.²³

While Williamson stands out as the leading pre-war thinker on aerial ASW, he was not alone. In 1913 Lieutenant Charles Dennistoun Burney, the son of Admiral Cecil Burney (himself the first chairman of Fisher's A/S committee),²⁴ wrote an article for the *Naval Review* discussing the subject.²⁵ Submarine warfare was a significant focus in the 1913 *Naval Review*, and was discussed in other aspects, although Burney was the one to focus on naval aviation as a component of submarine warfare.²⁶ Lieutenant Burney had also been on the pre-war A/S committee, but was appointed on half-pay in 1911 as a contractor with the Bristol corporation to develop seaplane technology.²⁷ Burney believed that airplanes would be able to spot submarines on the surface by their periscopes, and potentially while submerged in clear water as well. Like Williamson, he believed that airplanes would work best as scouts for the fleet, though also attacking submarines if the opportunity presented itself.²⁸ Notable is Burney's concept of warship protection as there was relatively little belief before the war that submarines would dare to attack merchant ships, given their lack of prize crew or accommodations for captured ship's crews. The alternative, abandoning the prize regulations to carry out a sink-on-sight policy was

²⁰ Lt. H. A. Williamson. Aeroplanes for Naval Service. March 1912, CCC WILMN 1/1.

²¹ Raleigh, *WIA*, vol. I, p. 266. Although the draft held by the Churchill Archives is dated March 1912, the paper was originally drafted in January.

²² Williamson, the Aeroplane in use against Submarines, March 1912, CCC WILMN 1/1, p. 2.

²³ Layman, *Naval Aviation*, p. 80. Goulter, 'Royal Naval Air Service', p. 54.

²⁴ Nicholas Lambert, *The Submarine Service, 1900-1918* (London: Ashgate Publishing Company, 2001), p. 128 fn.

²⁵ C. D. Burney, 'Air Power,' in *NRJ*, vol. 1, no. 2 (1913), pp. 57-75.

²⁶ Peter Padfield, 'The Submarine as Commerce Raider,' in *Dreadnought to Daring*, pp. 95-111.

²⁷ Hackmann, 'Burney, Sir (Charles) Dennistoun, Second Baronet (1888-1968)'.

²⁸ Burney, 'Air Power', p. 63.

considered anathema to the civilized conduct of war at sea, recognized by Britain and Germany alike.²⁹

Captain G. W. Vivian, who commanded HMS *Hermes* at the 1913 naval maneuvers, produced a lecture on the uses of seaplanes which was delivered at the Royal Navy War College, Portsmouth, in December that year.³⁰ Vivian believed that submarines would be most vulnerable in the clear water of the Mediterranean whereas the stormy North Sea would provide a greater measure of protection for submerged submarines. Like other pre-war theorists, Vivian suspected that seaplanes would be most useful in detecting and reporting submarines, rather than at attacking them, although he did not discount the possibility of an attack capability developing in the future.³¹

Lieutenant F. L. M. Boothby, commander of HMS *Bramble*, was a critical player amongst the Royal Navy's air-minded junior officers. In 1912 he published an article in *JRUSI*, discussing the use of aircraft for the Navy.³² Interestingly, Boothby, like Vivian, Burney, Williamson, and Sueter, believed that seaplanes should be designed specifically with the intention of conducting submarine search missions.³³ Boothby, however, preferred airships in the A/S reconnaissance role, as their large crew and powerful wireless transmitters would provide a definite advantage over seaplanes.³⁴ Echoing Williamson, Boothby also believed that a special kind of surface ship should be designed to carry airplanes at sea, something more efficient than the existing converted seaplane carriers.

There was general agreement amongst air-minded officers that airplanes would have an important role to play in ASW. The pre-war theory, as with other cases in the history of the RNAS, such as the 'Mayfly' disaster or the gunfire spotting difficulties experienced at the Dardanelles, also demonstrated a certain constraint of imagination, in that the theorists of aerial ASW were focused on the submarine as a threat to the fleet, rather than as a merchant raider.

Nevertheless, the technological experimentation continued apace and by March 1912 the first purpose built seaplanes and early flying boats had been designed and tested.³⁵ In June 1912

²⁹ Messimer, *Find and Destroy*, p. 11.

³⁰ Captain G. W. Vivian, Précis of Lecture on 'SEA-PLANES', The Uses and Employment of Sea-Planes in War. Royal Naval War College Portsmouth, December 1913, NMM VIV/8.

³¹ *Ibid*, p. 7.

³² F. L. M. Boothby, 'Aircraft for Sea Service,' *JRUSI*, vol. 56, no. 1 (June 1912), pp. 751–80.

³³ *Ibid*, p. 752.

³⁴ *Ibid*, pp. 768, 779.

³⁵ Raleigh, *WIA*, vol. I, pp. 185–6.

experiments were carried out at Harwich and in September at Rosyth to determine if seaplanes could in fact detect submarines from the air.³⁶ Eastchurch's Commander Charles Samson, while conducting experiments at the Firth of Forth in October that year, was able to demonstrate that periscopes could indeed be spotted from the air, and that the submarine's trailing oil slick was visible 'from altitudes between 1,200 and 3,000 feet'.³⁷ Critically, Samson was also able to demonstrate that communication between aircraft and destroyers was possible using a combination of flares, klaxons, and, on the part of friendly ships, sirens and semaphore. Starting in November 1912, the Churchill administration began to construct a series of airship sheds and air stations along the eastern English coast. Once the bases were in place RNAS squadrons could be assigned to the local SNOs, or controlled centrally by the Air Department. In an early example of district command, the Admiral of Patrols (after 1 May 1914 Commodore George Ballard), was assigned a pre-war air establishment of 50 W/T equipped aircraft, with responsibility for the entire east coast.³⁸ By May 1914 the entire Naval Wing was comprised of 35 airplanes (30 at Eastchurch) and 55 seaplanes, the latter spread across five seaplane stations, which Commodore Ballard intended to use in combination with surface flotillas and submarines to conduct both coastal and long-range patrols.³⁹

One of the experimental hurdles to overcome was the issue of bomb dropping, significant for the airplane's future success as an offensive instrument in the A/S role. Vivian and Burney agreed that it was not only possible but probable that bombs would be used to attack submarines. Burney favoured small projectiles of 30 lbs while Vivian discussed the development of 100 lb bombs.⁴⁰ Experiments carried out at the beginning of 1914 by Commander Samson, with assistance from Lieutenant Robert Clark-Hall, determined that 100 lb bombs could be dropped safely from 350 ft.⁴¹ It was discovered that 230 lbs was the best compromise between aircraft carrying capacity and hitting power, although the first 230 lb bombs were not deployed until

³⁶ Ibid, p. 267.

³⁷ Abbatiello, 'Doctrinal Innovation in the Royal Naval Air Service', p. 36.

³⁸ Lambert, *Sir John Fisher's Naval Revolution*, p. 286. N. A. M. Rodger, 'Ballard, George Alexander (1862-1948), Naval Officer,' *ODNB*.

³⁹ Abbatiello, *Anti-Submarine Warfare*, p. 84. Extracts from the Second Annual Report by the Air Committee on the Royal Flying Corps. C.I.D. 190B, dated 9 May 1914, CAB 38/27/22, #41 in Roskill, *Documents*, p. 129.

⁴⁰ Burney, 'Air Power', p. 61. Captain G. W. Vivian, *Précis of Lecture on 'SEA-PLANES', The Uses and Employment of Sea-Planes in War*. Royal Naval War College Portsmouth, December 1913. VIV/8, NMM, p. 3.

⁴¹ Raleigh, *WIA*, vol. I, p. 268.

May 1917.⁴² By 1918, 520 lb A/S bombs were designed for use with the Blackburn Kangaroo aircraft.⁴³

Sueter, Williamson, Vivian, Boothby, Burney and others knew that submarines were a threat, and that the Naval Wing ought to be doing more to counter that threat. There was general agreement that new surface ships would have to be designed to conduct A/S search and destroy missions. Airships would likely provide support, in association with their function as fleet scouts. Once located, submarines would be attacked by the airplane's bombs, and, if the airplane carried a wireless transmitter, a report would be sent back to the fleet or coastal station providing escort destroyers with a location to search.

On 26 October 1913 Churchill authored a minute elaborating the tactical missions required of Britain's naval aviation. The First Lord did not specifically mention an A/S capability, rather, in this case, focusing on patrolling more generally.⁴⁴ Marder stated that Churchill, in a 17 March 1914 address to the House of Commons, reiterated his intention that the Naval Wing was to be used for coast defence and scouting. Churchill believed that aircraft would have a key role to play, both for warning merchant shipping of the presence of commerce raiders, as well as for locating submarines from the air.⁴⁵ Churchill was reiterating his position from the previous March, when he had predicted that the Naval Wing would play a role in locating and destroying submarines in the near future.⁴⁶ Tellingly, however, commerce raiders and submarines were not yet considered synonymous.

Understandable confusion over the impact of submarines and aircraft on naval warfare meant that the important A/S role, despite the efforts of the service professionals, had slipped through the cracks. Part of the explanation was purely technical: larger, more powerful airplanes, airships and seaplanes, capable of carrying heavy ordnance and the necessary W/T equipment had not yet been developed. The Navy was aware of the problem, and an effort was being made to improve the technical quality of aircraft and airships. An Air Department lecture on aircraft produced in 1913 focused exclusively on the technical aspects of airplanes and airships, but,

⁴² Notes on the Co-operation of Aircraft with surface craft for Escorting Convoys of Merchant Ships, Air Division, Naval Staff, December 1918, AIR 10/860, p. 12.

⁴³ King, *Armament of British Aircraft*, p. 45.

⁴⁴ Winston Churchill, Tactical Objects for which Naval Seaplanes are required, First Lord minute, 26 October 1913, AIR 1/2496.

⁴⁵ Marder, *FDSF*, vol. I, p. 337.

⁴⁶ Mr. Churchill's statement on Navy Estimates, 26 March 1913, HC, vol. 50, cc. 1774.

again, did not specifically mention an A/S role.⁴⁷ Recognition of the inadequate preparations came in December 1913 when a sub-branch of the Navy was established to determine the best methods for air attack against submarines.⁴⁸

The 1913 naval manoeuvres provided some training experience in aerial ASW. Deploying from HMS *Hermes*, seaplanes equipped with W/T sets were able to transmit Morse code submarine contact reports.⁴⁹ Three patrols were organized at Cromarty air station, with the result that further contact reports were ‘immediately sent to the Naval Intelligence Centre, situated at the Coastguard Station, who repeated it by wireless to the Senior Officer of Patrols stationed at Fortrose’. The result was a deployment of torpedo boats that located and were deemed to have put out of action submarine *D3*.⁵⁰ The focus of these trials was on providing the fleet with an aerial A/S capability, rather than focusing on the protection of merchant shipping that would become an issue starting in February 1915. In the event the coastal patrol scheme favoured by Winston Churchill ended up focused on the anti-Zeppelin campaign for which the Navy was, from August 1914 to February 1916, entirely responsible. The initial losses of warships to submarine attack during the remainder of 1914 seemed to reiterate the concern that it was in this capacity that the submarine was most threatening, diverting attention from the prospect of submarine warfare against merchant shipping.

Admiral Fisher, retired since January 1911, had predicted the submarine’s impending use as a counter-blockade weapon in a January 1914 paper that in May he forwarded to Prime Minister Asquith. Fisher argued that at present ‘no means exist of preventing hostile submarines emerging from their own ports and cruising more or less at will.’⁵¹ Williamson, in his March 1912 paper, was of the same opinion stating that no defence existed to prevent submarines from acting as counter-blockade vessels near a friendly port, despite the air developments to date.⁵² Fisher and Williamson were supported in this regard by Admiral Sir Percy Scott, who explicitly predicted, in a *Times* article in early 1914, that the submarine probably would be utilized as a commerce raider, violating the strictures of international law meant to protect the crews of

⁴⁷ Air Department, *Aeroplanes for Naval Service*, 1913, AIR 1/626/17/88, p. 25.

⁴⁸ Goulter, ‘Royal Naval Air Service,’ p. 54.

⁴⁹ Appendix No. 1. Report of Captain of *Hermes* on Use of Aircraft During Manoeuvres. In W. H. May’s Report, August 1913. AIR 1/626/17/46, p. 82.

⁵⁰ *Ibid*, p. 85

⁵¹ John Fisher, *Records* (London: Hodder and Stoughton, 1919), p. 183.

⁵² *Aeroplanes for Naval Service*. March 1912, CCC WILMN 1/1, part II, p. 1.

merchant shipping from outright belligerent attack. Although a number of naval officers shared Scott's concern, he was opposed by others such as Rear-Admiral Bacon who refused to believe that a civilized power would stoop to such underhanded means.⁵³ The debate regarding the submarine as a commerce raider in the pre-war period was inconclusive, with powerful voices advocating both thesis and antithesis with no consensus emerging. In fact, both sides of the debate proved at least partially correct.

After 1 July 1914 the RNAS adopted A/S patrol and base bombing as its primary contribution to ASW. Local commanders, not directly engaged in Churchill's initiatives, had to make use of the RNAS squadrons attached to the stations in their naval districts, which meant little coordination of effort and a relentless struggle for resources, as the RNAS was quickly dispersed to distant theatres. This situation did not change until the Air Department was reorganised in July 1915.

The Introduction of Unrestricted Submarine Warfare, 1914 - 1916

When the war started Churchill put into practice his sweeping pre-war offensive plans. For the RNAS this meant a rapid deployment to the continent. The first air patrols covered the BEF crossing in August 1914, considered a great missed opportunity for the U-boats to inflict a crippling blow before the arrival of the British Army in France.⁵⁴ With Churchill orchestrating the defence at Antwerp, and Samson racing around the Belgian countryside in his armoured cars, the responsibility for covering the English Channel and Belgian coast fell to Squadron Commander Arthur Longmore's No. 1 Wing, shortly deployed to Dunkirk.

While undertaking these overseas functions the RNAS was also responsible for protecting the English mainland from enemy attack, which meant patrolling the coastline for approaching Zeppelins and enemy surface vessels. When Admiral Fisher returned to the Admiralty on 30 October he recognized the need for a stop-gap measure to fill in for the missing seaplanes required for more routine A/S patrol. The Navy had suffered a series of significant warship losses to submarines and mines early in the war, and Fisher was as determined as ever to do something about it. The First Sea Lord held a meeting on 31 October, with the result that he appointed George Holt Thomas, a civilian technical advisor for the Aircraft Manufacturing

⁵³ Padfield, 'The Submarine as Commerce Raider', pp. 96-7.

⁵⁴ Warner, *Lighter Than Air*, Chapter 4, loc. 3182. Messimer, *Find and Destroy*, p. 5.

Company Limited (Airco) to design a prototype.⁵⁵ Soon, however, the Admiralty became distracted by the rushed planning for the Dardanelles affair, and it was not until 28 February 1915, after Germany declared the War Zone around Britain, that Fisher was able to mobilize the Air Department to actually deliver the blimps he imagined.⁵⁶ Writing to Grand Fleet C-in-C Admiral Jellicoe, Fisher described these ‘Sea Scouts’ (SS) as potential submarine destroyers (Fisher’s phrase, typically rendered in all capitals), and it has since been noted that Fisher and his team had essentially invented the precursor to the helicopter.⁵⁷ Sueter, with the First Sea Lord’s support, tasked Commander E. A. D. Masterman, head of the Air Department’s Section H (Airships), along with airship pioneer Wing Commander N. F. Usborne, to develop the emergency program.⁵⁸

The first machine was primarily designed by Holt Thomas and was completed in only three weeks, built from pre-fabricated components: a single Willows envelope coupled to a BE2 aircraft fuselage, sporting a 70 hp Renault engine, providing for 8 hours endurance at 40 to 50 mph.⁵⁹ A second prototype designed by Wing Commander Usborne followed with the third model, Sea Scout 3, being the production model. These scouts were fitted with a W/T transmitter and receiver sets, and could carry 160 lbs of bombs. By June 1915 there were 50 Sea-Scouts on order, although only 13 were actually delivered by the end of that year.⁶⁰ Fisher, after his resignation during the May crisis of 1915, was soon made the chairman of the Board of Invention and Research (BIR), a Royal Navy think tank that first met on 19 July at the Hotel Metropole. Fisher continued his advocacy for aerial research, appointing Professor R. J. Strutt (later the fourth Baron Rayleigh, the son of the chairman of the Advisory Committee for Aeronautics, Lord Rayleigh, and a physics professor at Imperial College, London), to oversee the BIR’s airship, aeroplane and seaplane sub-committees.⁶¹

In May 1915 the larger Coastal (C) type non-rigid airships had also been introduced. This was another Usborne blimp project, composed of two Avro aircraft fuselages attached back-to-

⁵⁵ Freeman, *Tempestuous Genius*, Chapter 23, loc. 4841.

⁵⁶ Layman, *Naval Aviation*, p. 82.

⁵⁷ Fisher, *Memories*, p. 125. Popham, *Into Wind*, pp. 41-2.

⁵⁸ Warner, *Lighter Than Air*, Chapter 4, loc. 3454.

⁵⁹ Abbatiello, ‘British Naval Aviation’, p. 37.

⁶⁰ Marder, *FDSF*, vol. IV, p. 81.

⁶¹ Willem Hackmann, *Seek & Strike: Sonar, Anti-Submarine Warfare and the Royal Navy, 1914-54* (London: Her Majesty’s Stationery Office, 1984), p. 18. List of Committees appointed to consider Questions arising during the Present War, 31 March 1916, CAB 42/11/11, p. 27.

back with lift provided by a 'tri-lobe' balloon.⁶² Improved versions were manufactured as the war continued, and the Sea Scout was eventually replaced by the improved SSZ, or type Zero. While the original SS could carry 160 lbs of bombs for 8 hours, the SSZs could carry 350 lbs with endurance for 12 hours, a testament to the exponential improvement in, what was in fact, completely new technology developed within two years. Over the course of the war 36 Sea Scouts entered service, while 66 of the improved SSZs were also built. 22 C* (Coastal-Star) and 31 C-type also entered service. The largest non-rigid airships built for the Royal Navy were the 12 North Sea-type, with a crew of ten and capable of carrying 700 lbs of bombs for over 20 hours.⁶³ The Royal Navy had also engineered its own rigid airships, and those began to join the fleet late in 1917, although their function proved to be mainly in a training and coastal reconnaissance role, with a single notable exception (see below).

The non-rigid balloons were a relative success although this was one of the few bright spots against an otherwise dismal backdrop at the Air Department in 1915. The commitments in the Dardanelles and East Africa, in addition to the responsibility for the air defence of Britain 'strained the limited resources of the RNAS,' and only a few coastal stations were able to carry out regular air patrols.⁶⁴ Sueter had ordered that prototype flying boats should be developed based on the recommendations of Squadron Commander Porte in the fall of 1914, and success with these in November eventually prompted an order for 50 machines, to be known as the H4-type, unfortunately late, in March 1915.⁶⁵

Fisher and Churchill resigned during the May crisis, and the Air Department was reorganised by the incoming administration of Admiral Sir Henry Jackson and former Prime Minister Arthur Balfour. The result was a major administrative transformation in stages, beginning with the declaration on 29 July that the RNAS was henceforth absorbed into the Navy. The immediate result was to place the RNAS station commanders directly at the disposal of their district SNOs who were now responsible for devising and carrying out any required air patrol missions.⁶⁶ This was the model of the Coast Guard as applied to the RNAS, something Churchill

⁶² Abbatiello, 'British Naval Aviation', p. 37.

⁶³ Ibid, p. 39.

⁶⁴ Abbatiello, *Anti-Submarine Warfare*, p. 86.

⁶⁵ H. J. C. Harper, 'The Development of the Flying Boat,' in *JRUSI*, vol. 82, no. 526 (1937), p. 361.

⁶⁶ Admiralty Weekly Order No. 1204/15, 29 July 1915, ADM 1/8408, #72 in Roskill, *Documents*, pp. 212-3.

had proposed in 1913 (although Sueter had opposed the idea in February 1914, by January 1915 he changed his mind).⁶⁷

During the remainder of 1915 Balfour's primary concern was preventing, or responding to, the Zeppelin attacks against London. Air patrols that prioritized high-altitude Zeppelin sweeps were thus emphasized at the expense of lower altitude submarine patrols.⁶⁸ By decentralizing the RNAS Balfour put the onus on the naval air stations to find means of carrying on the offensive against the submarines. With resources stretched to the limit this was no easy task. On 25 June Vice-Admiral David Beatty proposed to Balfour that Admiral Lewis Bayly be appointed to command a detached squadron of submarine hunting vessels, including '...6 or more airships, 20 or more aeroplanes,' plus destroyers, trawlers, motorboats and submarines, to sweep the North Sea for U-boats.⁶⁹ Bayly, however, had fallen out of favour over the loss of HMS *Formidable*, torpedoed and sunk at Star Point early in the morning on New Year's Day 1915 by *U24*. Bayly, who had been commander of the Channel Fleet, was held responsible.⁷⁰ In July, at the Admiralty's displeasure, he was sent instead to command Queenstown and the western approaches to Ireland, ironically to become one of the most important districts in the A/S campaign.⁷¹

In November, Rear-Admiral George Ballard became the first Rear-Admiral East Coast of England, an evolution of the Admiral of Patrols position he had previously held. Ballard worked closely with his associated commanders, amongst them the SNOs Lowestoft, Harwich, Grand Fleet, The Nore, and VA Dover. These were the precursors of the regional commands that Jellicoe established in 1917.⁷² Ballard's major concern was orchestrating the transition from

⁶⁷ Churchill Minute to Colonel Seely, Secretary of State for War, 6 December 1913, #36, Some Minutes by Mr. Churchill on Aviation Matters, September

-December 1913, ADM 1/8621, in Roskill, *Documents*, p. 119. Christopher Bell, *Churchill And Sea Power* (Oxford University Press, 2013), p. 85. Draft Proposals by Captain Murray F. Sueter, Director Air Department, Admiralty, for the Reorganisation of the Naval Air Service, 24 February 1914, ADM 1/8378, #43 in Roskill, *Documents*, p. 146. Director Air Department, Murray Sueter, Administrative changes and discipline of the Royal Naval Air Service, 5 January 1915, ADM 1/8408/7. See also, Extracts from Admiralty Weekly Order No. 166 of 5 February 1915 'Naval Air Service-Reorganisation', ADM 1/8408, #62 in Roskill, *Documents*, pp. 193-4.

⁶⁸ Abbatiello, *Anti-Submarine Warfare*, p. 86.

⁶⁹ Marder, *FDSF*, vol. II, p. 362.

⁷⁰ Marder, *FDSF*, vol. II, pp. 98-9. See also, Gibson and Prendergast, *German Submarine War*, p. 19.

⁷¹ W. M. James and Andrew Lambert, 'Bayly, Sir Lewis (1857-1938), Naval Officer,' *ODNB*.

⁷² Massie, *Castles of Steel*, p. 322.

oversea patrols to coastal patrols specifically.⁷³ The primary mission at this phase of the war was to defeat the Zeppelins that were raiding the English coast.⁷⁴

Expansion of the Patrol Schemes During 1916

In February 1916 the RNAS relinquished its responsibility for Britain's air defence to the Army, including the by now quite large London area defence network (see Chapter Six). Debate was ongoing amongst the service chiefs regarding the correct spheres of operation for the two air services. At the second JWAC meeting on 28 February for example it was concluded that the SNOs and General Officers Commanding (GOCs) would conduct all air operations unless these involved a scale of effort that required the question to be sent to the CNS and Director of Military Operations for further decision.⁷⁵ This was effectively a recognition of the status quo as it had emerged since July 1915 when the Air Department's direct control over the squadrons was transferred to the SNOs.⁷⁶

One of the significant results of the decentralization of the Air Department was that A/S patrols were implemented on an *ad hoc* basis by the individual district commanders. By circumventing communications with the Air Department itself, this reform improved tactical communication between the district SNOs, RNAS station commanders, and air and surface craft.⁷⁷ However, the decentralization also hindered capability as the RNAS squadrons attached to the individual districts often lacked the required seaplanes or pilots to carry out useful patrols. The district commanders themselves held different opinions about the best use of naval aircraft, and this could lead to wasted resources and effort. The Rear-Admiral East Coast of England (Rear-Admiral Stuart Nicholson replaced George Ballard in May), had in August 1916 produced a memorandum that was circulated to DAS Vaughan-Lee, emphasizing coast defence.⁷⁸ Patrols were divided into three types: coastal, anti-zeppelin and A/S. Coastal defence aimed at catching

⁷³ Extracts from Letter No. 1102/W.552 of 31 October 1915 from Rear-Admiral G. A. Ballard, Admiral of Patrols, to the Secretary of the Admiralty, AIR 1/650, #86 in Roskill, *Documents*, p. 250.

⁷⁴ Extracts from Admiralty Letter M.08235 of 26 October 1915, AIR 1/650, #85 in Roskill, *Documents*, p. 249.

⁷⁵ Hankey to Admiralty, Conclusions of the Second JWAC meeting, 7 March 1916, ADM 1/8449, #108 in Roskill, *Documents*, pp. 317-8.

⁷⁶ Conclusion of the Second Meeting, held at 2 Whitehall Hardens, S. W., on Monday, February 28, 1916, ADM 1/8449.

⁷⁷ Goulter, *A Forgotten Offensive*, p. 10.

⁷⁸ Orders re Aircraft Patrols issued to Air Stations under Command of R. A. C. East Coast, 16 August 1916, AIR 1/635/17/122/117. Abbatiello, *Anti-Submarine Warfare*, p. 87.

transiting Zeppelins and even in 1916 was still the priority.⁷⁹ The German naval raid against Lowestoft and Great Yarmouth on 24 April 1916 exposed the deficiencies in this system, when routine air patrols failed to locate the large German raiding group (the raiding force was, however, detected by British signals intelligence). Great Yarmouth was the site of one of the original NAS, and Lowestoft was the headquarters for the district SNO, both important facilities that could have been targeted. Scheer's force instead focused on demolishing private residences and attacking shore batteries. Scheer claimed later that he was acting in support of the Irish Easter rebellion.⁸⁰

The case of Vice-Admiral Bayly, the Admiral Commanding Queenstown, is representative of the one-step forward, two-steps back effect of Balfour's policy. Bayly was known to be 'lukewarm' about using seaplanes as he considered they would require diverting his limited supply of sloops and patrol craft for support.⁸¹ Likewise, Commodore Lowestoft was unimpressed by his airship assets, notably the Coastal types operating from Pulham station.⁸² It was invariably useful for airships and seaplanes to range over coastlines controlled by multiple districts with the result that some form of horizontal inter-regional cooperation, regardless of Admiralty policy, would be necessary. The Admiralty however still needed to exert vertical control on occasion, as was demonstrated in September 1916 when Balfour established a patrol scheme through the Calshot air station and its substations, all under the command of C-in-C Portsmouth.⁸³ Patrols of Short seaplanes were now launched from the Bembridge base on the Isle of Wight, capable of covering the Channel.

The Dunkirk and Dover air stations, under Wing Captain Lambe's overall command, were unique in that they possessed enough resources to carry out regular operations throughout 1915 and 1916. Lambe, much like Commander Samson, favoured bombing as the surest means of reducing the submarine threat through the attack of their bases. This was one of the legacies of Churchill's insistence on developing the means to strike the enemy's Zeppelin bases.⁸⁴ The first success at directly attacking the enemy's submarine capability through aerial bombardment took

⁷⁹ Orders re Aircraft Patrols issued to Air Stations under Command of R. A. C. East Coast, 16 August 1916., AIR 1/635/17/122/117, p. 2.

⁸⁰ Marder, *FDSF*, vol. II, p. 425. Corbett, *Naval Operations*, vol. III, pp. 303-4.

⁸¹ Jones, *WIA*, vol. IV, p. 46. Marder, *FDSF*, vol. IV, p. 82.

⁸² Fife, *British Airship Bases*, Chapter 5: RNAS Airship Stations in East England.

⁸³ Jones, *WIA*, vol. II, pp. 424-5.

⁸⁴ Martin Gilbert, *The Challenge of War: Winston S. Churchill, 1914-1916*, vol. III (London: Mandarin Paperbacks, 1990), p. 66.

place on 24 March 1915. Five pilots from Longmore's No. 1 Squadron, based at Dunkirk and including Squadron Commander I. T. Courtney and Flight Lieutenant Harold Rosher, raided the U-boat base at Hoboken near Antwerp (only Courtney and Rosher arrived on target), supposedly damaging two submarines.⁸⁵ The difficulty of bombing Antwerp produced a shift in targets, with Bruges, Ostend and Zeebrugge now the priority.⁸⁶ Occasionally patrols did encounter submarines, such as on 26 August when Squadron Commander A. W. Bigsworth dropped two 65 lb bombs on a submarine near Ostend.⁸⁷ Or again on 28 September when Flight Sub-Lieutenant T. E. Viney with a French observer in a Henry Farman airplane also dropped two 65 lb bombs on a submarine, believing - in error - to have destroyed it.⁸⁸

RNAS Dover and Dunkirk were re-organised in April 1917, following the standard procedure for all RNAS wings during Admiral Jellicoe's tenure as First Sea Lord. No. 1 Wing was stationed at St. Pol, composed of Nos. 2, 9 and 12 Squadrons. No. 4 Wing was headquartered at La Panne, comprised of Nos. 4, 10 and 11 Squadrons. No. 5 Wing was at Couderkerque composed of No. 5, 7 and 15 squadrons. There were approximately 150 aircraft on establishment.⁸⁹

1916 had been a year of re-arming and re-training. The learning curve model, discussed by historians of the Western Front,⁹⁰ was very much in evidence as although new technology was now entering service the best practices had yet to be devised and dissemination of experience was haphazard. By August 1916 the RNAS comprised 2,401 officers and 20,355 men, an enormous expansion when 28 months prior, in May 1914, the entire RNAS had numbered only 111 officers and 544 men.⁹¹ The RNAS non-rigid airship complement expanded by 25 to 47, while the total aircraft establishment grew by 40 to reach 160 machines at the end of 1916.⁹² Although these were significant advances, as yet no reliable aerial A/S weapons existed and thus

⁸⁵ Owen Thetford, *British Naval Aircraft since 1912* (London: Putnam, 1978), p. 36.

⁸⁶ Development and Operations of the R.N.A.S. in Home Waters, Submarine Campaign, Part II. AIR 1/677/21/13/1902.

⁸⁷ Jones, *WIA*, vol. II, p. 377. Also *Flight*, vol. 7. no. 36, 3 September 1915, p. 648.

⁸⁸ Jones, *WIA*, vol. II, p. 378. See also *Flight*, vol. 7. no. 50, 10 December 1915, p. 978.

⁸⁹ Abbatiello, 'British Naval Aviation', p. 100.

⁹⁰ Gary Sheffield, *Forgotten Victory, The First World: Myths and Realities*, Kindle ebook (Endeavour Press Ltd., 2014), loc. 5057-65. Jim Beach, 'Issued by the General Staff: Doctrine Writing at British GHQ, 1917-1918,' in *War in History*, vol. 19, no. 4 (November 2012), pp. 464-91.

⁹¹ Abbatiello, *Anti-Submarine Warfare*, p. 87. Extracts from the Second Annual Report by the Air Committee on the Royal Flying Corps. C.I.D. 190B, dated 9 May 1914, CAB 38/27/22, #41 in Roskill, *Documents*, p. 131.

⁹² Abbatiello, *Anti-Submarine Warfare*, p. 89.

aircraft and blimp patrols could do little more than annoy the enemy's submarines. It was diplomatic pressure from the neutral United States that, once again, kept the submarine war limited. The decision by the German high command to recommit to the strategy of unrestricted sinking, in the hope of defeating Britain in 1917, was expected to result in American intervention. Therefore, any German victory in 1917 or 1918 would have to come quickly, before the United States would be able to fully mobilize and intervene. By the end of 1916 'the utility of aircraft in submarine hunting had undoubtedly been small... the operations were for the most part of a disjointed nature, no definite or coordinated system had been yet evolved for utilizing the service of the air to the best possible advantage.'⁹³ For the RNAS in the A/S role, coastal defence and patrol remained the primary focus.

The Air Department and the 1917 Reforms

During 1917 and 1918 Germany ordered a total of 493 submarines in a reckless gambit to knock Britain out of the war.⁹⁴ Germany thus reintroduced unrestricted submarine warfare in February 1917. The resulting rapid escalation in shipping losses put pressure on the Admiralty to deliver results in the A/S struggle.⁹⁵ The beginning of this third phase of unrestricted submarine warfare generated a crisis that forced the Air Department to increase its contribution to ASW.

The Admiralty's A/S policy for 1917 was laid out by First Sea Lord Jellicoe's appointee to head the new ASD, Rear-Admiral Alexander Duff. In January Duff conducted an 'exhaustive survey' of A/S methods and concluded that two general lines of policy should be followed, namely, focusing on the attack of submarines wherever located (patrols), combined with the increased protection of merchant shipping.⁹⁶ Duff believed that seaplanes and airplanes should act offensively, seeking out and harassing the enemy's submarines, an opinion he shared with First Sea Lord Jellicoe.⁹⁷ Duff's policy in effect meant more aircraft patrols from the coast, combined with destroyers and other escorts patrolling established sea lanes. The result of this policy in some ways made the situation worse, unfortunately, as it spread-thin defensive resources. Jellicoe meanwhile emphasized patrol of the coastal approaches, hoping to keep

⁹³ Ibid, p. 1.

⁹⁴ Appendix III, F: Submarine Programs in Gibson and Prendergast, *German Submarine War*, p. 360.

⁹⁵ Air Ministry, Air Historical Branch. The RNAS in Home Waters. January 1917 – April 1918, Part II: Submarine Campaign. AIR 1/677/21/13/1902, p. 7.

⁹⁶ Ibid, p. 2.

⁹⁷ Jones, *WIA*, vol. IV, p. 46.

Allied merchant vessels concentrated near the more easily defended coasts. Again the Admiralty seemed to have handed an opportunity to the U-boats, as the restricted coastal approaches were particularly vulnerable to Germany's short range coastal (UB) and minelaying (UC) type submarines.

When he succeeded Admiral Sir Henry Jackson, Jellicoe reshuffled the Air Department by removing Rear-Admiral Vaughan-Lee as DAS and, on 10 January, introducing Commodore Godfrey Paine, formerly the commandant of the CFS at Upavon and then of the officer school at RNAS Cranwell, as the new Fifth Sea Lord. Paine's primary experience was with personnel and training but according to Jellicoe, Paine 'devoted much energy to the provision of suitable aircraft' for A/S purposes.⁹⁸

The trade routes converging along the west coast of Britain and Ireland were highly exposed until at the beginning of 1917, as no air stations had yet been built to cover the west coast of the United Kingdom. Vice-Admiral Bayly, who had been appointed by Balfour to the Queenstown command, was concerned that the technical limitations of early seaplanes would cause interference with his surface patrol operations and thus opposed an Admiralty proposal to build air stations on the southern coast of Ireland, even as late as the closing months of 1916.⁹⁹ This oversight of the development of seaplane and airship bases on the west coast turned out to be a significant error. The entry of the United States into the war in April 1917 made it necessary to protect the Western approaches from enemy submarines preying on cross-Atlantic traffic. Extreme measures were taken, such as the attempt to close off of the North Sea entrance between Norway and Scotland using an enormous mine barrage, combined with expanded minefields, nets and patrols in the English Channel, North Sea and along the coast of Belgium.¹⁰⁰

Jellicoe, meanwhile, realized that the district SNOs needed to be concentrated to make them useful for aerial ASW. Jellicoe's method, after his promotion to CNS, was to focus on regional commands to which senior RNAS officers would be directly attached. Beginning in 1917 the RNAS squadrons were thus formed into regional groups, under the command of a regional district commander, such as the C-in-C Portsmouth, C-in-C East Coast of England, or the C-in-C Plymouth, each with several SNOs under them. The RNAS regional structure proved

⁹⁸ Admiralty Board Minutes, Wednesday 31 January 1917, ADM 167/51. Jellicoe, *Crisis of the Naval War*, p 71.

⁹⁹ Layman, *Naval Aviation*, p. 31.

¹⁰⁰ Messimer, *Find and Destroy*, p. 181. See also, Dunn, *Securing The Narrow Sea*.

very useful and was maintained by the RAF when it was formed in 1918. By the end of the war there were nine RAF groups and one US Naval Air Service group operating from the British Isles, associated with fifteen district commands, of which the most important were Plymouth (Devonport, No. 9 Group), Portsmouth (No. 10 Group), Dover & Dunkirk (No. 5 Group, after July 1918 US Naval Air Service), The Nore, Harwich, Lowestoft (No. 4 Group), East Coast of England (No. 18 Group), Coast of Scotland (Rosyth, No. 22 Group), Orkneys and Shetlands & Grand Fleet, (No. 28 Group), Larne Harbour (No. 25 Group) and the Coast of Ireland (No. 11 Group & US Naval Air Service). The legacy of the RNAS expansion, base development and maritime patrol focus are clearly in evidence in the RAF's maritime and coastal arrangement late in the war.¹⁰¹ The wisdom of this organisational structure is that while it retained the advantage of *laissez faire* flexibility at the districts, it also recognized that a degree of doctrinal homogeneity and command authority was important at a larger geographical scale to prevent local repetition and disorder. To be most effective in the coastal patrol role the RNAS needed to be able to take advantage of its rapidity of response and range of operations, which would otherwise have been artificially constrained by district level parochialism had Jellicoe not advanced the RNAS group model. Although Jellicoe was simply following his standard procedure of centralization, the result on the decentralized RNAS was profound. With the regional commands now acting as hubs for information dissemination to the NAS nodes, Jellicoe had in fact created a hybrid system of control, combining local initiative and freedom of action with regional direction, comparable to the 'cybernetic structure' of the London Air Defence Area (LADA) as described by John Ferris.¹⁰²

The process of forming the RNAS regional commands therefore began in January 1917 when the Operations Division of the Naval Staff concentrated the NAS at the Nore, Harwich, Yarmouth, Killingholme, South Shields, Dundee and Houton Bay, into a single group to better facilitate coastal patrol and to operate the newly introduced Large America type flying boats. Grand Fleet C-in-C David Beatty wanted 150 of these for fleet work and coastal patrol, however, only 50 had been delivered to Felixstowe, Yarmouth, Killingholme, Calshot, Cattewater and the

¹⁰¹ Figure 5.1, RAF (Naval) Air Groups and major naval districts, 31 October 1918, Abbatiello, *Anti-Submarine Warfare*, p. 110.

¹⁰² Ferris, 'Achieving Air Ascendancy: Challenge and Response in British Strategic Air Defence, 1915-40,' in *Air Power History*, p. 31.

Scillies by the end of the war.¹⁰³ An aerial patrol scheme covering seven different regions was subsequently established.¹⁰⁴ On 11 March Jellicoe instructed Fifth Sea Lord Paine, along with DASD Duff and the Operations Division of the Staff, to devise a scheme for centralizing and standardizing airship and aircraft patrols on the East Coast, as part of the over-all reorganisation of the coastal patrol schemes, further evidence of Jellicoe's desire to reassert control over the RNAS.¹⁰⁵ This was a significant effort, involving a series of commands: C-in-C Nore, SNO Harwich, SNO Lowestoft, Rear-Admiral Commanding (RAC) East Coast of England, C-in-C Rosyth, and VAC Orkneys.

A test of the regional system came in May when an airship patrol scheme was put forward by Vice-Admiral Stuart Nicholson, C-in-C East Coast of England.¹⁰⁶ Essentially, he proposed changing the local airship patrols so that airships launched from Howden could proceed out of the district's area of operations, onto East Fortune or Pulham, and back again. This was significant as the communication between districts involved (East Coast of England, C-in-C Rosyth, Commodore Lowestoft, and C-in-C Coast of Scotland), were carried out at the newly established regional level. A recommendation to implement the scheme was forwarded to the Director of the Operations Division, Rear-Admiral George P. W. Hope, who approved the proposal on 21 May.¹⁰⁷

By July 1917 the new west coast bases had been built and airplane patrol schemes for the threatened approaches to England and Ireland were also established, modeled on the 'Spider Web' type patrols then in place from Felixstowe.¹⁰⁸ In the North Sea this system involved four flying boats conducting simultaneous survey over a 60 mile in diameter circle for five hours.¹⁰⁹ Reports were plotted at Felixstowe station from which additional flying boats were dispatched to investigate sightings.¹¹⁰

¹⁰³ Air Ministry, Air Historical Branch, *The RNAS in Home Waters. January 1917 – April 1918, Part II: Submarine Campaign*. AIR 1/677/21/13/1902, p. 11. Abbatiello, 'British Naval Aviation', pp. 144-5.

¹⁰⁴ Jones, *WIA*, vol. IV, p. 48.

¹⁰⁵ Air Ministry, Air Historical Branch, *The RNAS in Home Waters. January 1917 – April 1918, Part II: Submarine Campaign*. AIR 1/677/21/13/1902, p. 11. Jones, *WIA*, vol. IV, p. 48.

¹⁰⁶ Rear-Admiral East Coast, Suggested new scheme of aerial patrols on the East Coast, 18 May 1917, AIR 1/641/17/122/223.

¹⁰⁷ Rear-Admiral Commanding East Coast of England to Admiralty, No. 1634/W.548/14, 19 May 1917, AIR 1/641

¹⁰⁸ Jones, *WIA*, vol. IV, pp. 48-9. Hallam, *The Spider Web*.

¹⁰⁹ Jones, *WIA*, vol. IV, pp. 53-4.

¹¹⁰ Abbatiello, 'British Naval Aviation', p. 141.

Following the procedures outlined by Jellicoe, the RNAS squadrons along the west coast were concentrated together as the South-West group, including patrols from bases on the Isles of Scilly (later RAF No. 234 Squadron), Newlyn (No. 235) and Cattewater (237 & 238), and the airship station at Mullion (No. 236), and, under the Vice-Admiral Old Milford, Pembroke (No. 255) and Fishguard (No. 245), together under the command of Wing Commander Gerrard, whose HQ was at Devonport, not far from his RN counterpart, the C-in-C Plymouth.¹¹¹

A similar scheme was established amongst the Channel stations in the C-in-C Portsmouth's district: Portland (later RAF No. 241 Squadron), Newhaven (No. 242), Bembridge, and after 26 July, Cherbourg, and Lee-on-Solent starting 5 October, together with the kite-balloon station at Tipnor and the submarine scout and coastal-type airship station at Polegate,¹¹² all reporting to Wing Commander A. W. Bigsworth whose HQ was created at Calshot (No. 240) in January 1918, at that time also the location of the Seaplane School.¹¹³

This pattern of regionalization in practice returned some of the centralization that had been lost when Balfour subordinated the RNAS to the district SNOs in July 1915. By the middle of 1917 the RNAS had gone through three distinct phases of control. As Abbatiello stated, the changes in leadership 'caused an almost constant reorganising of naval air supervision and policy; such inconstant senior supervision meant that the anti-submarine role for aircraft did not mature steadily.'¹¹⁴ Indeed, the RNAS under Churchill's command had been treated as a military branch of the Navy, such as the Royal Marines or Naval Infantry, and Churchill had planned to use the RNAS as a supplement, if not replacement, for the Coast Guard. When the Air Department relinquished responsibility for the Air Defence of England in February 1916, the importance of coastal and maritime patrol as the essential RNAS role was redoubled, however the focus remained on the high-flying Zeppelins rather than the U-boats.

The Admiralty, using the information delivered from coastal patrols, signals intelligence, and the merchant marine, established a plot to collect all the information related to submarine movements in May 1917 in particular from wireless Direction Finding (D/F), so that reports could be rapidly dispatched directly to the NAS commanders.¹¹⁵ The direct line was of

¹¹¹ Jones, *WIA*, vol. IV, p. 48. Abbatiello, 'British Naval Aviation', p. 138.

¹¹² Fife, *British Airship Bases*, Chapter 3, loc. 907.

¹¹³ Abbatiello, *Anti-Submarine Warfare*, p. 89. Abbatiello, 'British Naval Aviation', p. 140. See also, RNAS Portsmouth Group, General Report of Work Carried out during year 1917, 2 December 1917, AIR 1/659.

¹¹⁴ Abbatiello, 'British Naval Aviation', pp. 17-19.

¹¹⁵ Jones, *WIA*, vol. IV, p. 50.

communication was critical because U-boats, like Zeppelins, could be detected by British or French D/F stations when they used their W/T to communicate.¹¹⁶ The original communication lines had been established by Sueter in 1915 as part of the Air Department's air defence scheme, but it was now necessary to expand the network. The officer behind this expansion was the versatile Commander Williamson.¹¹⁷ Williamson, who had been head of Section 11 of the Naval Staff's Operations Division (Air Operations),¹¹⁸ now became the head of the ASD's internal Air Section.¹¹⁹ Williamson also introduced the ASD Anti-Submarine Reports, which he started to compile in June 1917.¹²⁰ These were tabulations of all RNAS A/S operations, similar to the operational reports (albeit of a broader scope) that had been produced by Lieutenant-Commander Richard C. M. Pink for the DAS starting in late 1915.¹²¹

RNAS aircraft offered the most rapid response to submarine sightings and if the aircraft were able to reach the U-boats before they could submerge, possibly the most effective means of attack. An escorting destroyer comparatively, in a typical A/S attack, might expend as many as 40 depth-charges trying to sink a U-boat whereas one or two well placed bombs could have a significant impact.¹²² Other than the prototype hydrophone systems that began to be tested in the summer of 1917, there was no certain method for detecting a submerged submarine and thus the best chance of a successful attack came from aircraft able to manoeuvre into position before the submarine could submerge.

The new flying boats on which so much expectation rested were first delivered by Glenn Curtiss. Known as 'America' models, these first appeared in mid-1916 and were steadily improved at RNAS Felixstowe. These machines offered a powerful A/S capability that had previously been lacking.¹²³ The large multi-engine flying boats were ideal for searching large areas of ocean over many hours, and although long patrols could be tiring for the pilots, the

¹¹⁶ Llewellyn-Jones, *The Royal Navy and Anti-Submarine Warfare*, p. 8.

¹¹⁷ Abbatiello, 'Doctrinal Innovation in the Royal Naval Air Service', p. 42.

¹¹⁸ Air Department. Organisation & Duties of Admiralty Concerning the Air Services. June 1917 – February 1918. AIR 1/279/15/226/127, pp. 2, 4.

¹¹⁹ Figure 7.1, 'The structure of the Anti-Submarine Division, n.d. [January 1918],' in Black, *British Naval Staff*, p. 223, ADM 137/2715.

¹²⁰ See AIR 1/2105, and AIR 1/626.

¹²¹ Lt. Commander R. C. M. Pink to DAS, Royal Naval Air Service, Communique No. 3, 22 December 1915, AIR 1/2577.

¹²² Llewellyn-Jones, *The Royal Navy and Anti-Submarine Warfare*, p. 10.

¹²³ Layman, *Naval Aviation*, p. 82.

flying boats possessed both the speed and payload required to usefully carry out attacks against submarines caught in the open.

Wing Commander John Cyril Porte, the Felixstowe NAS commander, had a stellar pedigree in this regard. His association with aircraft stretched back to his time as a submariner in 1908 when as a Lieutenant he had been attached to HMS *Mercury*, a submarine depot ship, and then gone on to command submarine C38.¹²⁴ In 1909 Porte was working on glider development, and a year later was experimenting with 35-hp monoplanes. After lessons at Rheims in July 1911 he received an *Aero Club de France* pilot's certificate, but was medically retired from the Royal Navy in October due to a lung ailment.¹²⁵ Porte was next employed as a technical advisor with the Deperdussin Company in Gosport and then he traveled to America to work for Curtiss directly at Hammondsport, where he was diligently employed designing flying boats. When the war broke out Porte returned to England to join the RNAS.¹²⁶

During 1915 Squadron Commander Porte was attached to RNAS Hendon where he fulfilled training duties until 27 September when he was appointed to command the experimental Felixstowe station, and he soon set to work improving flying boat design.¹²⁷ Curtiss delivered H-8 flying boats to Porte in July 1916, but these were found to be underpowered. Porte re-designated the flying boats as H-12s, the 'Large America' model, in which the 160 hp Curtiss engines were replaced with 275 hp Rolls Royce engines.¹²⁸ The H-12 proved a capable A/S weapon, equipped with four Lewis guns and two 230 lb bombs. Porte continued to improve his designs and by 1918 had developed a localized variant known as the Felixstowe flying boat. The successful F2A model was powered by two 345 hp Rolls Royce Eagle VIII engines, capable of accelerating the big aircraft up to 100 mph at 2,000 ft while carrying a dozen Lewis guns and up to 500 lbs of explosives. These late-war models could remain airborne for up to six hours.¹²⁹ The advanced F3 and F5 models could carry more than 900 lbs of bombs and, in gunship-like

¹²⁴ Service record of J. C. Porte, ADM 196/49/9. Colledge and Warlow, *Ships of the Royal Navy*, p. 223.

¹²⁵ Hobbs, *Royal Navy's Air Service*, pp. 18-9.

¹²⁶ Harper, 'The Development of the Flying Boat', p. 361. Service record of John Cyril Porte, ADM 196/143/234, also ADM 196/49/9.

¹²⁷ *The Naval Who's Who, 1917*, p. 261. Raleigh, *WIA*, vol. I, pp. 464-5.

¹²⁸ *Ibid*, p. 362.

¹²⁹ Thetford, *British Naval Aircraft since 1912*, pp. 194-6.

fashion, experiments had been carried out with the 6pdr Davis recoilless gun, developed by the RNAS and the Royal Navy since late 1916.¹³⁰

It is necessary to briefly describe the development of hydrophone technology as much of the effort had been orchestrated by the Air Department followed by the Air Division in 1918. The first hydrophones were attached to shore stations starting in late 1916, with the more advanced Mark I and II models entering service in 1917.¹³¹ The Air Division under Captain F. R. Scarlett continued the work, and on 18 March 1918 Scarlett authorized hydrophone experiments to be carried out at Calshot.¹³² Scarlett recognized that duplicate efforts were taking place under the C-in-C Nore at the Isle of Grain experimental seaplane station, and so moved the entire project there on 25 March. In the event the combination of aircraft, hydrophones and surface assets can be said to have achieved only a single success: the extraordinary destruction of *UB115*, made possible through the combined efforts of RN airship *R29*, the destroyer HMS *Ouse*, and a group of trawlers equipped with hydrophones.¹³³

In early 1917, however, hydrophones were still in the prototype stage, useful for shore-stations but too impractical to be used by destroyers or other escorts, let alone from the air. Experiments were attempted with hydrophone equipped airships, but were abandoned as seaplanes were found to be the more suitable platform.¹³⁴ The Felixstowe base for flying boats became the operational node for the planned North Sea patrols, with the ‘Spider Web’ patrol scheme going into effect on 13 April 1917, centered on the North Hinder light vessel.¹³⁵

Vice-Admiral Beatty at the Grand Fleet was also looking for solutions to the submarine problem.¹³⁶ Beatty’s defensive method was to employ large numbers of aircraft, including older models and trainers such as the DH4 and DH6, to suppress the U-boats if not directly attack them, a concept described as ‘scarecrow’ tactics.¹³⁷ In June 1917 Beatty also ordered the Caldale Airship Station to conduct daily patrols with missions including convoy escort, as well as mine

¹³⁰ King, *Armament of British Aircraft*, p. 183. Director Air Services Commodore Godfrey Paine to Admiralty, Royal Naval Air Service, Policy and Development, 21 January 1917, ADM 1/8478/10, p. 3.

¹³¹ Messimer, *Find and Destroy*, p. 115.

¹³² F. R. Scarlett note on C in C Nore, Hydrophone Experimental fitting of seaplanes, 25 March 1918, AD369, AIR 1/275.

¹³³ Hackmann, *Seek & Strike*, p. 70. Jones, *WIA*, vol. VI, p. 348.

¹³⁴ *Ibid*, p. 68.

¹³⁵ Jones, *WIA*, vol. IV, p. 54.

¹³⁶ Air Ministry, Air Historical Branch. The RNAS in Home Waters. January 1917 – April 1918, Part II: Submarine Campaign. AIR 1/677/21/13/1902, p. 14.

¹³⁷ Jones, *WIA*, vol. VI, p. 331.

and submarine detection.¹³⁸ Beatty's contact at this point was the C-in-C Rosyth, Admiral Sir Frederick T. Hamilton, until his death in October 1917, and then Admiral Cecil Burney. By February 1918 Burney was able to produce his own orders for the aircraft working with the convoys under his command, and he stressed the need for close communication between aircraft and convoy escorts.¹³⁹

Beatty also formed the small Destroyer Kite Balloon Force, composed of five destroyers equipped with kite-balloons to act as an A/S flotilla.¹⁴⁰ Kite-balloons were found to be especially effective given that the enemy's submarine commanders knew that the fixed balloons could identify submarines and direct gunfire against them with relative ease, thus 'as soon as a submarine sees a kite-balloon it submerges and remains submerged'. Kite-balloons could also be operated at night, providing aerial protection lacking from the day-time aircraft patrols.¹⁴¹

With Jellicoe as CNS the naval staff started to exert greater control over the planning and execution of ASW. While the Deputy Chief of the Naval Staff (DCNS), Rear-Admiral Henry Oliver, handled Operations and Plans, Rear-Admiral Duff, now Assistant Chief of the Naval Staff (ACNS), controlled a multi-departmental organisation that included Convoys, Trade and Anti-Submarine departments. The ASD was headed, following Duff's promotion, by Captain W. W. Fisher who, together with Fifth Sea Lord Paine, desired an integrated approach to the submarine threat including seaplanes, flying boats, airplanes, and airships all in conjunction with surface craft.¹⁴² Normally several aircraft conducted a typical routine patrol, but the new procedure recommended keeping an additional machine held in reserve for emergency use. In the contact patrol model the aircraft were to operate closely with destroyers so that the air and sea platforms could maintain contact by pre-arranged waypoints.¹⁴³ The Naval Staff acted as a clearing house for these doctrinale recommendations, assimilating and disseminating the tactical recommendations that emerged from the SFOs attached to the regional commands and their district SNOs.

¹³⁸ Abbatiello, *Anti-Submarine Warfare*, p. 115.

¹³⁹ Abbatiello, 'British Naval Aviation', p. 183. See also Rosyth Secret Memorandum No. 067/19, 15 February 1918, AIR 1/291/15/226/140.

¹⁴⁰ Abbatiello, 'British Naval Aviation', p. 145.

¹⁴¹ Air Department. Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts. 30 March 1918. AIR 1/279/15/226/133, Appendix 4, p. 15.

¹⁴² Ibid, p. 9.

¹⁴³ Ibid, p. 10.

Recommendations continued to flow in from the districts. On 23 June 1917 DOD Hope addressed Vice-Admiral Bacon's concerns regarding the degraded quality of the machines available at Dunkirk, and recommended, based on conversation with CNS Jellicoe, that Dunkirk should receive airships to replace its seaplanes, in addition to new Bristol Scout biplanes.¹⁴⁴ As a result of this report ASD director Captain Fisher, with Hope and Bacon's approval, detached the seaplane carrier HMS *Riviera* for a roving A/S patrol, starting at the Scilly Isles and then followed by attachment to the C-in-C Devonport's command.¹⁴⁵

The North Sea, English Channel and Atlantic approaches were now flush with new equipment and airplanes, enabling systematic patrols and air escorted convoys. In the Mediterranean, however, the A/S effort was coming up short. In December 1916 CNS Oliver had proposed reducing the RNAS establishment at Malta and Gibraltar so that forces could be based at Otranto.¹⁴⁶ Early in 1917 the Admiralty dispatched Sueter to command the RNAS buildup at Otranto, where operations began in June.¹⁴⁷

When 1917 came to a close the RNAS squadrons involved in ASW had been successfully grouped into geographical regions, and re-equipped with flying boats and airplanes more suitable for the requirements of hunting submarines. New bases had been established on the western coast of the United Kingdom, and in the Mediterranean. New methods of tabulating intelligence and disseminating information had been devised and implemented. The first RNAS victories against the U-boats were recorded in April and May 1917, but the U-boats soon adapted to the new equipment and methods. Although convoy and escort ensured the U-boat threat was reduced, the submarines were still operating at large. The long-term technological and organisational maturation of the RNAS between 1914-1916 had produced real results, and just in time.

Accounting RNAS Anti-Submarine Victories in 1917-18

The first success almost immediately followed the introduction of the 'Spider Web' system. On 24 April an unknown submarine was attacked off the Portland Bill by an H-12 from Calshot with

¹⁴⁴ Director Operations Division, Rear-Admiral P. W. Hope minute to Vice-Admiral Bacon's cover-letter attached to Wing Captain Lambe's report on offensive operations at Dunkerque, 10 June 1917, AIR 1/641.

¹⁴⁵ DOD Hope and DASD Fisher minute to Vice-Admiral Bacon's letter of 4 July 1917, AIR 1/641.

¹⁴⁶ Henry Oliver to First Sea Lord, 15 December 1916, AIR 1/656.

¹⁴⁷ Treadwell, *The First Naval Air War*, pp. 41-2.

100 lb bombs, and a destroyer followed up with a depth charge attack that was believed to have sunk the enemy submarine. On 20 May Flight Sub-Lieutenants C. R. Morrish and H. G. Boswell, in Large America H-12 flying boat No. 8663, successfully attacked a U-boat with 230 lb bombs,¹⁴⁸ but it was the end of the month that was to bring the first complete victory: following a report by the decoy ship HMS *Acton*, Curtiss H-12 No. 8656, piloted by Lt. W. L. Anderson, sighted, bombed, and probably sank *UC66* north of the Isles of Scilly with four 100 lb bombs on 27 or 29 May.¹⁴⁹ The previously established narrative is that *UC66* was depth-charged by the trawler *Sea King* off the Lizard on 12 June, and then destroyed by a mine impact after passing through the Dover Barrage.¹⁵⁰ In sum, 13 coastal-type U-boats were attacked by flying boats based at Felixstowe, Killingholme, Calshot and Tresco between April and June 1917.¹⁵¹ Later, on 29 July, *UC16* and *UC65* were both attacked by flying boats in the North Hinder area.¹⁵²

Results dried up after this spate of initial successes as the German submarine crews adapted to the improved Royal Navy A/S measures. Although U-boats were regularly being sighted and attacked from the air, it was not until 22 September that another submarine was successfully destroyed by aerial means. On this occasion Flight Sub-Lieutenants N. A. Magor and C. E. S. Lusk, in Curtiss H-12 No. 8695, successfully bombed and destroyed *UB32* (believed at the time to have been *UC72*) with two 230 lb bombs off the East Hinder, near the Belgian coast.¹⁵³ This is notably the only accepted case in which a U-boat was destroyed by British aircraft independent of surface ships during the war.

¹⁴⁸ Harper, 'The Development of the Flying Boat,' p. 362.

¹⁴⁹ McCartney, 'Maritime Archaeology of a Modern Conflict', pp. 139, 160, 171. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 140. Gibson and Prendergast, *German Submarine War*, p. 372. Abbatiello, *Anti-Submarine Warfare*, p. 153.

¹⁵⁰ Steven R. Dunn, *Bayly's War* (Barnsley: Pen & Sword Books Ltd., 2018), p. 235 fn. Tomas Termote, *Krieg Unter Wasser: Unterseebootflotille Flandern, 1915-1918*, kindle ebook (Hamburg: E. S. Mittler & Sohn, 2015), *UC-Boote*, loc. 6912-6. See also, V. E. Tarrant, *The U-Boat Offensive, 1914-1945* (London: Cassel & Co., 2000), p. 54.

¹⁵¹ See Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, pp. 140-2.

¹⁵² Termote, *Krieg Unter Wasser*, *Ub-Boote*, loc. 4671-733. Grant, *U-Boats Destroyed*, p. 54 fn.

¹⁵³ *UB32* has also been credited to a Wight seaplane attack. The date of 18 August and location of Cape Barfleur is given, with Flight Sub-Lieutenant Mossop in a Wight seaplane receiving credit, see Gibson and Prendergast, *German Submarine War*, p. 372. See also, Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 49, and Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 170. Messimer, *Verschollen*, p. 154, Abbatiello, *Anti-Submarine Warfare*, p. 1. Eberhard Moller and Werner Brack, *The Encyclopedia of U-Boats From 1904 to the Present Day*, trans. Andrea Battson and Roger Chesneau (London: Greenhill Books, 2004), p. 45. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 142. Price, *Aircraft versus Submarines*, p. 23. Termote, *Krieg Unter Wasser*, *Ub-Boote*, loc. 4955.

Although *UB32* has become a unique and celebrated case in the history of aerial ASW, this was not what was believed during the war itself. Submarine *U69*,¹⁵⁴ along with coastal and minelaying types *UB12*,¹⁵⁵ *UB20*,¹⁵⁶ *UB36*,¹⁵⁷ *UB39*,¹⁵⁸ *UC1*,¹⁵⁹ *UC6*,¹⁶⁰ *UC36*,¹⁶¹ and *UC72*,¹⁶² were all variously credited as destroyed by RNAS or RAF aircraft. Careful scrutiny of German records, combined with modern marine archaeology, has however eliminated most candidates. *UB39* was believed to have been bombed by H-12 No. 8655 piloted by Flt. Lt. Scott and Flt. Sub-Lt. Paine on 24 April 1917, when they dropped two 100 lb bombs on a submarine 15 miles south of Portland and then directed a nearby destroyer to pursue with depth-charges on 24 April 1917.¹⁶³ It turned out that the U-boat they bombed had only been damaged and *UB39* actually sank in early May, when it ran into a mine north-west of Bruges.¹⁶⁴

UB20 was bombed while in dock at Bruges in May, and then again in June 1917, resulting in five weeks of repairs. The submarine departed Ostend on 28 July with a small crew of 17 to test repairs to the pressure hull and never returned to port. Initially, flying boat No. 8676 was credited with sinking *UB20* on 29 July,¹⁶⁵ however, recent investigation of the wreck site has indicated that the U-boat most likely stumbled into a newly laid British minefield and was destroyed.¹⁶⁶ *UC36* departed Zeebrugge on 16 May and by 30 May was reported missing.¹⁶⁷ Flying boat No. 8663, piloted by Flight Sub-Lieutenants Morrish and Boswell, bombed a

¹⁵⁴ Messimer, *Verschollen*, p. 88. Terraine, *Business in Great Waters*, loc. 1705-19.

¹⁵⁵ Jones, *WIA*, vol. VI, p. 346, claimed 12 August 1918 by a flight of DH4 from RAF Dunkirk, under command of Captain K. G. Boyd. Listed as unknown, stated to have left Zeebrugge on 19 August. Messimer, *Verschollen*, p. 133.

¹⁵⁶ Jones, *WIA*, vol. IV, p. 65. Gibson and Prendergast, *German Submarine War*, p. 372.

¹⁵⁷ Jones, *WIA*, vol. IV, p. 64. Gibson and Prendergast, *German Submarine War*, p. 372.

¹⁵⁸ McCartney, 'Maritime Archaeology of a Modern Conflict', p. 160. Termote, *Krieg Unter Wasser*, Ub-Boote, loc. 5130.

¹⁵⁹ Jones, *WIA*, vol. IV, p. 65.

¹⁶⁰ Ibid, p. 66.

¹⁶¹ Ibid, p. 54. Price, *Aircraft versus Submarines*, p. 22-3.

¹⁶² Jones, *WIA*, vol. IV, p. 73. Gibson and Prendergast, *German Submarine War*, p. 213., see Price, *Aircraft versus Submarines*, p. 23. Messimer, *Verschollen*, p. 310. Hobbs, *The Royal Navy's Air Service*, p. 263. Termote, *Krieg Unter Wasser*, Uc-Boote, loc. 7102.

¹⁶³ The conventional narrative is that *UB39* was destroyed on 17 May 1917 by the decoy schooner *Glen*. See Messimer, *Verschollen*, p. 161 & Gibson and Prendergast, *German Submarine War*, p. 181. See also, RNAS Portsmouth Group, General Report of Work Carried out during year 1917, 2 December 1917, AIR 1/659.

¹⁶⁴ Jones, *WIA*, vol. IV, p. 55. Innes McCartney, 'The Maritime Archaeology of a Modern Conflict: Comparing the Archaeology of German Submarine Wrecks to the Historical Text, Volume One', PhD thesis, (Bournemouth University, 2013), p. 160. Messimer, *Verschollen*, p. 161. Termote, *Krieg Unter Wasser*, UB-Boote, loc. 5130. RNAS Portsmouth Group, General Report of Work Carried out during year 1917, 2 December 1917, AIR 1/659.

¹⁶⁵ Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 141. Messimer, *Verschollen*, p. 141.

¹⁶⁶ Messimer, *Verschollen*, p. 142.

¹⁶⁷ Price, *Aircraft versus Submarines*, pp. 22-3.

submarine on 19 May, 22 miles east of the North Hinder Light Vessel, and attacked another submarine the following day with two 230 lb bombs, this time only ten miles from the North Hinder vessel.¹⁶⁸ Either of these attacks may have been against *UC36*, although that submarine is also suspected to have sunk near the Isle of Wight.¹⁶⁹ *UC72* was credited to flying boat No. 8695 in an attack near the Sunk Light Vessel on 22 September, however, the otherwise accepted narrative is that *UC72* was sunk by HMS *Acton*, that is, *Q34*, on 20 August in the Bay of Biscay.¹⁷⁰

UC6 was credited to flying boat No. 8676, and indeed that flying boat had been responsible for bombings a submarine near Thornton Ridge on 28 September 1917 as was dramatically retold by T. D. Hallam.¹⁷¹ Although in fact *UC6* hit a series of mines the day prior in the Thames estuary.¹⁷² Likewise, *UC1* was credited as destroyed by flying boat No. 8689 on 24 July south west of the North Hinder Light Vessel, near the coast of Flanders.¹⁷³ Wing Commander J. C. Porte himself led a flight of five flying boats that sighted and attacked a periscope nearby the North Hinder Light Vessel, dropping a total of five 230 lb bombs on the target, that they believed they had destroyed.¹⁷⁴ *UC1* had in fact departed Zeebrugge on 18 July bound for its mine laying target near Calais but was destroyed by an enormous explosion, most likely a mine or torpedo, before it could move beyond the Flemish coast.¹⁷⁵ Lastly, *U69* was believed to have been the victim of HMS *Patriot*'s depth-charge attack on 12 July, the location of the submarine having been exposed by the destroyer's kite-balloon, operated by Flight Lieutenant O. A. Butcher.¹⁷⁶ In fact *U69* vanished on 24 July while patrolling in the Irish Sea.¹⁷⁷ The significance of these cases is that they highlight the combined RN A/S effort, including the use of aircraft and kite-balloons. At the very least the presence of aircraft and patrolling airships

¹⁶⁸ Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 141. Hobbs, *The Royal Navy's Air Service*, p. 243.

¹⁶⁹ Termote, *Krieg Unter Wasser*, Uc-Boote, loc. 6363. Messimer, *Verschollen*, p. 271.

¹⁷⁰ Moller and Brack, *The Encyclopedia of U-Boats*, p. 62. Messimer, *Verschollen*, p. 310. Termote, *Krieg Unter Wasser*, Uc-Boote, loc. 7102.

¹⁷¹ Hallam, *The Spider Web*, pp. 106-9.

¹⁷² Gibson and Prendergast, *German Submarine War*, p. 373. Messimer, *Verschollen*, p. 243. Moller and Brack, *The Encyclopedia of U-Boats*, p. 54. Termote, *Krieg Unter Wasser*, Ub-Boote, loc. 6023-4.

¹⁷³ Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 142. Moller and Brack, *The Encyclopedia of U-Boats*, p. 44. Gibson and Prendergast, *German Submarine War*, p. 192.

¹⁷⁴ Jones, *WIA*, vol. IV, p. 65.

¹⁷⁵ Messimer, *Verschollen*, p. 237. Termote, *Krieg Unter Wasser*, Ub-Boote, loc. 5852-66.

¹⁷⁶ Messimer, *Verschollen*, p. 88. Terraine, *Business in Great Waters*, loc. 1705-19.

¹⁷⁷ Moller and Brack, *The Encyclopedia of U-Boats*, p. 30.

forced U-boats to run underwater, risking movement through the expanded Dover Barrage and North Sea minefields.

Some attacks that have since been reclassified to non-aerial activity should be revisited. The case of *UC36* is one such example. Lieutenants Morrish and Boswell, in Large America H-12 flying boat No. 8663, appeared to have destroyed *UC36* on 20 May 1917. The pilots were awarded a bounty after the war to that effect, however, the U-boat in question was later determined to have actually sank 20 nautical miles north east of the North Hinder Light Vessel and thus, had this been *UC36*, it was outside of its established patrol zone.¹⁷⁸ The conventional explanation is that *UC36* blew up on its own mines near the Isle of Wight on or around 19 May, although the possibility of a successful aircraft sinking should not be ignored.¹⁷⁹ Marine archaeologist Tomas Termote noted, however, that there are no UC type wrecks near the North Hinder Light Vessel, and thus it seems more likely that Morris and Boswell had only damaged their elusive U-boat prey.¹⁸⁰ The stress in these cases should be placed not on the low number of U-boats destroyed, or even the exact number of attacks, but in terms of the perception during the war that the RNAS was attacking submarines and achieving notable sinkings.

The introduction of new equipment, improved doctrine, and the close cooperation of surface ships with aircraft led to a number of successful aerial A/S actions during 1918: *UB31*, *UB59*, *UC70*, *UB83*, *UB103*, and *UB115*, were all destroyed with support from the air in various manners. *UB31* had its position in the Channel fixed in part by *SSZ29*, leading to the submarine's destruction when it hit a mine trying to avoid a surface A/S patrol consisting of three armed drifters on 2 May 1918.¹⁸¹ *UB59* was bombed in dry-dock on 16 May, repaired, and finally scuttled on 5 October.¹⁸² *UC70* was damaged by monitor fire adjusted by airship spotters, but later repaired, and then actually sunk on 28 August by the combination of a Blackburn Kangaroo's 520 lb bomb and depth-charging by HMS *Ouse*. *UB83* was sunk by HMS *Ophelia*, a destroyer with an attached kite-balloon, on 10 September.¹⁸³ *UB103* was located by the Sea Scout blimp *SSZ1*, piloted by Ensign N. J. Learned, USN, on 16 September, and then sunk trying

¹⁷⁸ Jones, *WIA*, vol. IV, p. 54. Harper, 'The Development of the Flying Boat', p. 271. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 141. McCartney, 'Maritime Archaeology of a Modern Conflict', p. 57.

¹⁷⁹ Robert Grant, *U-Boats Destroyed* (London: Putnam, 1964), p. 152. Messimer, *Verschollen*, p. 271.

¹⁸⁰ Termote, *Krieg Unter Wasser*, Uc-Boote, loc. 6361-4.

¹⁸¹ Termote, *Krieg Unter Wasser*, Ub-Boote, loc. 4917. Messimer, *Verschollen*, p. 153. McCartney, "Maritime Archaeology," p. 84. Moller and Brack, *The Encyclopedia of U-Boats*, p. 45. Messimer, *Verschollen*, p. 153.

¹⁸² Dunn, *Securing The Narrow Sea*, p. 201.

¹⁸³ Messimer, *Verschollen*, p. 208.

to escape depth-charging by channel drifters when it drove through a minefield.¹⁸⁴ The rigid airship *R29* located *UB115* on 29 September, resulting in the submarine's destruction by surface ships.¹⁸⁵ Elsewhere, *U39* had been forced to intern itself in Spain following French seaplane attacks.¹⁸⁶ The destruction of Germany's submarines was gradually taking place, as the combined methods instituted by Jellicoe, and accelerated by Wemyss and Geddes the following year, paid off. New machines such as the Blackburn Kangaroo, developed by H. A. Williamson, and new doctrine circulated by F. R. Scarlett at the Air Division contributed to the successful efforts in 1918. During the war Germany produced 373 U-boats, of which, 145 were claimed destroyed by British efforts. 30 U-boats were sunk by depth-charging,¹⁸⁷ and 11 were sunk by Q-ships.¹⁸⁸ At least six submarines were destroyed by aircraft with surface vessel support, and another one or two most likely by aircraft operating alone, for a total of eight U-boats destroyed through the involvement of British aircraft in some manner.

Despite this relatively small tally of A/S victories by the RNAS and RAF it is useful to keep in mind the number of *attacks* carried out. Attacks could still be operationally significant if they caused damage or forced a U-boat to abandon its patrol. Squadron Commander T. D. Hallam and his assistant Lieutenant Partidge (Royal Navy Volunteer Reserve) RNVR, managed to generate 550 'spider web' patrols over the North Sea between May and December 1917, during which 44 submarine were reported and 25 attacked with bombs, indicating a steady A/S effort.¹⁸⁹ During 1917 Wing Commander Bigsworth's Channel Group flew 1,540 patrol missions; 406 Sea Scout and Coastal airship sorties from Polegate in addition to 29 kite-balloon sorties from Tipnor. Enemy submarines were encountered 27 times, resulting in eight attacks considered to have caused damage.¹⁹⁰ RAF Groups No. 9 (Plymouth), No. 10 (Portsmouth), and No. 18 (East Coast of England) conducted 48 attacks against enemy submarines between July and the end of September 1918.¹⁹¹

¹⁸⁴ Mowthorpe, *Battlebags*, p. 80. Messimer, *Verschollen*, p. 214.

¹⁸⁵ Layman, *Naval Aviation*, p. 211. Jones, *WIA*, vol. IV, p. 55. Grattan, *The Origins of Air War*, p. 155. Abbatiello, *Anti-Submarine Warfare*, p. 177. Price, *Aircraft versus Submarines*, p. 29. Jones, *WIA*, vol. VI, p. 348. McCartney, 'Maritime Archaeology of a Modern Conflict', pp. 103-4.

¹⁸⁶ Price, *Aircraft versus Submarines*, p. 22-3

¹⁸⁷ Hackmann, *Seek & Strike*, p. 71.

¹⁸⁸ Marder, *FDSF*, vol. II, p. 356.

¹⁸⁹ Harper, 'The Development of the Flying Boat', p. 364. Kinsey, *Seaplanes – Felixstowe*, p. 43.

¹⁹⁰ RNAS Portsmouth Group, General Report of Work Carried out during year 1917, 2 December 1917, AIR 1/659

¹⁹¹ Appendix XVIII: Comparison of Anti-Submarine Flying Operations Between Groups Nos. 9, 10, and 18 from 1st July 1918 to 20th September 1918, in Jones, *WIA*, Appendixes, p. 88.

182 attacks against submarines were reported by air or seaplanes, and another 26 attacks carried out by airships, across all theatres other than the Mediterranean between February 1917 and October 1918.¹⁹² Patrol sorties increased steadily during 1917 and 1918. 671 airplane sorties in February 1918 jumped to 1,209 in March, 1,526 in April and then 2,751 in May, leading to the wartime high of 4,485 patrol sorties flown in August. Airship patrols increased alongside these figures, from 415 to 846 between April and May 1918, to the monthly high of August when 785 patrols were flown.¹⁹³ If a U-boat was reported as spotted it was very likely to be attacked by planes or airships, although airplanes, responsible for 267 sightings, or roughly one sighting every other day between June 1917 and October 1918, were much more effective than airships, the latter accounting for only 47 total sightings during the same period.¹⁹⁴

The Convoy System and Air Escort

The new methods were achieving their purpose, a fact reflected by the declining loss rate of merchant shipping in the North Atlantic and around the English coast. The serious merchant shipping losses had peaked in April 1917 at the same time as the new air patrol methods were going into practice, in conjunction with the introduction of convoys.¹⁹⁵ In June 1917 only 46 airplane and 46 airship escort missions were flown, a number that dramatically increased the following year first to 176 airplane and 184 airship escort missions in April, and then the jump to 402 airplane and 269 airship escort missions in May 1918. 1,340 airplane and 454 airship escort missions were flown in August, at the peak of the A/S effort.¹⁹⁶

First Sea Lord Jellicoe was on the right approach in February 1917 when he wrote that it was imperative to change policy, while simultaneously becoming much more efficient in terms of merchant sailings, thus allowing fewer merchant ships to be escorted more thoroughly.¹⁹⁷ New air stations were being constructed at key points around the coast and the disparate RNAS Wings were grouped together into regional commands, attached to their neighbouring RN district HQs. Frustratingly for David Lloyd George, Jellicoe did not specify what his ‘new methods’ were

¹⁹² Abbatiello, *Anti-Submarine Warfare*, p. 174, Appendix 1: Merchant losses and aircraft sorties.

¹⁹³ Ibid.

¹⁹⁴ Ibid.

¹⁹⁵ Air Ministry, Air Historical Branch. The RNAS in Home Waters. January 1917 – April 1918, Part II: Submarine Campaign. AIR 1/677/21/13/1902, p. 14. Temple Patterson, *Jellicoe Papers*, vol. II, p. 114.

¹⁹⁶ Abbatiello, *Anti-Submarine Warfare*, p. 174, Appendix 1: Merchant losses and aircraft sorties.

¹⁹⁷ First Sea Lord memorandum for War Cabinet, 21 February 1917, ADM 1/8480, #33 in, Temple Patterson, *Jellicoe Papers*, vol. II, pp. 144-5.

exactly or what else could be done beside increasing area patrols. In fact Jellicoe oversaw a massive arms build-up, with mines, depth-charges, escort ships of all kinds, and new aircraft and airship construction moving at peak rates for British and Allied industry.

Jellicoe would have no doubt compelled the district SNOs to adopt convoy if he thought it the answer, but in February he did not yet agree. There was plenty of dissenting opinion in the service and no clear answer to the critiques raised about the ratio of merchant ships to escorts, or the other claims raised in opposition to the mass adoption of convoy.¹⁹⁸ Vice-Admiral Bayly, still C-in-C Queenstown, favoured sea route patrols by surface craft over aircraft altogether, although he changed his mind as more reliable aircraft were introduced.¹⁹⁹ Commodore Reginald Tyrwhitt of the Harwich Force wanted to escort trade across the North Sea to Holland.²⁰⁰ The Vice-Admiral Orkneys and Shetlands favoured escorts over patrols, while Vice-Admiral Stuart Nicholson, the C-in-C East Coast of England, endorsed escort as the appropriate response for the most valuable cargo.²⁰¹ Grand Fleet C-in-C Beatty favoured North Sea escorts, while at the ASD Alexander Duff favoured the establishment of specified sea-lanes that could be patrolled, the system Jellicoe had adopted at the beginning of the year.²⁰²

The introduction of convoy after July 1917 added another layer to the RNAS mission set. Abbatiello identified four convoy types for which the RNAS provided air cover: short-distance convoys between Britain and Europe, warship escort (including the Grand Fleet), trans-oceanic convoys, and all other coastal convoys around British waters.²⁰³ Convoy roles were defined, like patrols, by the district commanders although during 1917 the focus was shifting to the new RNAS regional groups.²⁰⁴ Regionalism, or re-concentration, had been the basis of Jellicoe's policy for coastal defence at the Admiralty, essentially taking the model of the old Admiral of Patrols and applying it to the entire United Kingdom.²⁰⁵ As a result, Jellicoe was wary about forcing convoys upon the district SNOs, preferring instead to let the regional commanders handle implementation.

¹⁹⁸ Marder, *FDSF*, vol. IV, pp.115-36.

¹⁹⁹ Black, *British Naval Staff*, p. 179.

²⁰⁰ *Ibid.*

²⁰¹ *Ibid.*

²⁰² Abbatiello, 'British Naval Aviation', p. 138.

²⁰³ Abbatiello, *Anti-submarine Warfare*, pp. 109, 118.

²⁰⁴ Abbatiello, 'British Naval Aviation' p. 163.

²⁰⁵ *Ibid.*, p. 164.

The details in general were often left to the districts, however, a form of standard model did emerge. Airplanes were grouped into staggered flights for flying convoy cover during daylight hours. Without escort carriers this would essentially be a mission for flying boats and airships launched from coastal air stations. Airships were especially useful for sweeping the ocean ahead of the convoy routes.²⁰⁶ Kite-balloons, which had been adapted into the fleet's inventory as observation and gunfire-spotting platforms, were also useful aboard convoy escorts. Admiral Beatty, who was advised on aerial matters by Vice-Admiral Sir John de Robeck of the 2nd Battle Squadron, ordered kite-balloon trials in support of convoys in July 1917.²⁰⁷ Wing Captain Gerrard's South West Group (under C-in-C Plymouth), prepared a patrol scheme for the area around Cornwall and the channel approach in August, and in September produced written orders primarily focusing on airships for convoy escort.²⁰⁸

Of increased importance in Gerrard's area of operation was RNAS Tresco on the Isles of Scilly, the construction of which began in February 1917 and was operational that April. Between April and November 1917, H-12 flying boat 8656 of No. 34 Squadron (RNAS Tresco) flew 42 sorties, or 77 hours' worth of patrols. As the boats were worn out or lost they were replaced with newer models capable of greater endurance. Flying boats such as H-12 N4341 flew 239 hours during 85 sorties between March and October 1918, while Felixstowe F3 N4243 flew 43 sorties and 123 hours from June 1918 until the end of the war.²⁰⁹ Four flying boats were operating each month during the summer of 1917, declining to one or two during the winter but then increasing to five and eventually six during the height of the 1918 campaign in August, the same month No. 34 Squadron was formally transferred to the RAF as No. 234 Squadron.²¹⁰

On the east coast Wing Commander Charles Samson, returned from his tour in the eastern Mediterranean, now assumed command of Great Yarmouth NAS, RAF No. 228 Squadron, later recalling that the '[p]rotection of our shipping against attack from submarine and aircraft' was the number one priority.²¹¹ Samson's North Sea experience culminated in a significant air-sea battle, involving flying boats, seaplanes, Zeppelins, surface vessels, and

²⁰⁶ Jones, *WIA*, vol. IV, pp. 59-60.

²⁰⁷ Abbatiello, *Anti-submarine Warfare*, p. 116.

²⁰⁸ Ibid, p. 119. SW Group Patrol Orders, 1 September 1917, AIR 1/644/17/122/292, see also Peter London, *U-Boat Hunters: Cornwall's Air War 1916-19*, Mount Hawke, Truro: Dyllansow Truran (1999), p. 89.

²⁰⁹ London, *U-Boat Hunters*, p. 88.

²¹⁰ Lewis, *Squadron Histories*, p. 79.

²¹¹ Samson, *Fights and Flights*, p. 356.

minelayers, fought out during August. The threat to his airships from enemy aircraft was particularly worrying as the airships could only operate in areas already clear of enemy aircraft. The threat from German aircraft increased in 1918 and First Sea Lord Wemyss, who had replaced Jellicoe in December 1917, was forced to withdraw the Pulham Coastal non-rigid patrols following the loss of *C17* and *C27*, it was believed to enemy seaplanes.²¹²

Improvements in training and education continued apace. In March 1918 the learning to date was incorporated into a number of manuals, released on the eve of the RNAS's dissolution. The Airship Service also published its own manual, 'Notes on Aids to Submarine Hunting' that same month.²¹³ Another manual entitled 'Use of Aircraft for the Protection of Shipping' was printed on 30 March, mere days before the creation of the RAF.²¹⁴ This document highlighted the experience gained to date and emphasized the importance of aircraft cover for convoys. Reiterating a long-standing concern of the Air Department and NAS commanders, the manual stated that 'the methods of using aircraft should so far as is practicable be standardised and, not as at present, left to the idiosyncrasies of local staffs and Commanding Officers' indicating the latitude that Jellicoe's regional control model had allowed.²¹⁵

The creation of a unified tactical doctrine seems to have originated with newly appointed RAF Colonel Hugh Williamson. Williamson, now the commander of RAF No. 18 Group (under C-in-C East Coast of England), favoured a combined arms scheme and thus proposed a tiered system of airplanes flying convoy escort in reliefs, with the non-rigid airships providing the convoy with close-in support.²¹⁶ In August 1918 Williamson produced a paper on the use of airplanes for ASW.²¹⁷ He observed that the new specialty aircraft, notably the Blackburn Kangaroo he had helped design, was superior to both airships and seaplanes. As for convoy escort 'the Enemy's submarines have been seriously hampered in their operations by the constant

²¹² Abbatiello, *Anti-Submarine Warfare*, p. 92.

²¹³ Notes on Aids to Submarine Hunting, March-April 1918, ADM 186/415.

²¹⁴ Air Department. Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts, 30 March 1918, AIR 1/279/15/226/133.

²¹⁵ Ibid, p. 1.

²¹⁶ Abbatiello, 'Doctrinal Innovation in the Royal Naval Air Service', p. 43. Abbatiello, *Anti-Submarine Warfare*, p. 124. Col H. A. Williamson, Aircraft on Convoy Escort, East Coast Command, 15 September 1918, AIR 1/289/15/226/139.

²¹⁷ Hugh Williamson, Employment of Aeroplanes for Anti-Submarine Work, 14 August 1918, AIR 1/642/17/122/252.

fear of being attacked or sighted by aircraft.²¹⁸ Williamson recommended moving to 520 lb bombs for his Blackburn aircraft as he considered the 230 lb bomb ineffective.²¹⁹ Flag Captain Powlett, sitting in for the Vice-Admiral East Coast of England who was on leave, forwarded Williamson's letter to the Admiralty within three days where Colonel R. M. Groves, another RNAS veteran and Air Division Director, read this letter on 26 August and approved.²²⁰

Despite the introduction of convoys coastal patrol remained the mainstay of the RNAS ASW effort throughout the war. By the end of March 1918, the Air Department estimated that only 7% to 20% of total patrols conducted had been devoted to directly protecting merchant shipping, while the vast majority of hours flown were of the coastal patrol type.²²¹ The Air Division reiterated that the district SNOs should be specifically instructed to conduct convoy escort missions, while a specialised staff should focus on the use of aircraft in the escort role. This staff would communicate directly with the districts to ensure compliance with the Air Division's recommendations.²²² The issue of accord between the SNOs and station commanders, prior to the creation of the Air Ministry, had been left to the responsibility of the Fifth Sea Lord.²²³

The Royal Air Force and the Air Division of the Naval Staff in 1918

In January 1918 it was recognized that the Naval Staff required a separate Air Division to handle the administration and operational planning of the RNAS, while also acting as a liaison between the Admiralty and the newly created Air Ministry.²²⁴ The Air Division of the Naval Staff had been authorized by Jellicoe in mid-December 1917, one of his final acts as First Sea Lord,²²⁵ and then implemented by First Sea Lord Wemyss in January 1918. It was placed in the Old Building,

²¹⁸ Colonel Hugh Williamson, Employment of Aeroplanes for Anti-Submarine Work. 14 August 1918. AIR 1/642/17/122/252, p. 1.

²¹⁹ Ibid, p. 2.

²²⁰ R. M. Groves, Director Air Division, minute to: Hugh Williamson, Employment of Aeroplanes for Anti-Submarine Work. 26 August 1918, AD 3845, AIR 1/642.

²²¹ Air Department, Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts, 30 March 1918, AIR 1/279/15/226/133, p. 5.

²²² Ibid, pp. 6-7.

²²³ Memorandum as to the functions of the Fifth Sea Lord and Director of Air Services, June 1917, AIR 1/279/15/226/127, p. 3.

²²⁴ Office Memorandum, 14 January 1918, AIR 1/279/15/226/127, p. 3.

²²⁵ Proposed Establishment of Air Division of Naval Staff, 16 December 1917, ADM 1/8508/285. Marder, *FDSF*, vol. IV, p. 341.

in rooms 16 (HQ), 45 (Material), 41 (Airships) and 42 (Operations).²²⁶ Despite all of the efforts taken so far in March 1918 the Air Division Director could argue that the RNAS station commanders and squadron pilots still lacked 'knowledge of various matters in relation to enemy submarines which must govern the policy they pursue.'²²⁷ The solution was the publication of new manuals covering the practicalities of submarine identification and attack.

The Air Division ensured that the Naval Staff would retain some control over air assets despite the formation of the Air Ministry.²²⁸ The organisation was 'staffed by RAF officers, most of whom were former RNAS members'.²²⁹ The first Director was Wing Captain F. R. Scarlett, the former head of the Central Air Office, Sheerness. Shortly after taking office, Scarlett pointed out the lack of knowledge concerning the training of RNAS pilots and observers for operating against submarines. In March the Air Division began drafting a manual to educate expected RAF aeroplane pilots, outlining submarine capabilities for the newly created RAF.²³⁰ For its part, the Air Ministry's A/S plan was brute force, involving the transfer of 27 flights between April and June 1917, for an eventual total of 34 flights - 204 DH6 aircraft - employed in A/S duties.²³¹ These aircraft were short on W/T equipment and furthermore the Admiralty was required to provide the observers. A new observer school was therefore formed at Aldeburgh.²³² Scarlett's office produced a training scheme for A/S work at the end of May. Newly trained observers would be qualified to rapidly transmit W/T signals, read and communicate semaphore, navigate, carry out bombing attacks, recognize friendly and enemy vessels, and train with the machine gun – essential naval tasks that required years to cultivate.²³³

The Air Division was central to the development of this expanded training scheme. The staff at the Air Division produced a wide range of published manuals covering aspects of the A/S campaign. One such manual that has been subsequently cited as being of critical importance was

²²⁶ Black, *British Naval Staff*, pp. 304-5.

²²⁷ Director Air Division, Supply to those actively engaged in anti-submarine operations with intelligence relating to types, performance and probably tactics of enemy submarines, 8 March 1918, AD35, AIR 1/273.

²²⁸ Chapter 1: Admiralty Organisation, Jellicoe, *The Crisis of the Naval War*, loc. 467.

²²⁹ Abbatiello, 'British Naval Aviation' p. 22.

²³⁰ 'Memorandum by Captain F. R. Scarlett, Director Air Division, Naval Staff, dated 7 March 1918' AIR 1/273, #231, Roskill, *Documents*, pp. 635-7.

²³¹ DAD Scarlett & W. A. Robinson to Secretary of the Admiralty, 5 April 1918, AIR 1/656.

²³² Jones, *WIA*, vol. VI, p. 335fn.

²³³ Training of Personnel for Anti-Submarine Work, Memorandum by Captain F. R. Scarlett addressed to Assistant Chief of Naval Staff (Vice-Admiral Sir A. Duff) and 2nd Sea Lord (Vice-Admiral Sir H. L. Heath), dated 31 May 1918, AIR 1/274, #256 in Roskill, *Documents*, p. 676.

the 'Notes on the Co-operation of Aircraft with Surface Craft for Escorting Convoys of Merchant Ships', published in late 1918.²³⁴ The manual described best practices for seaplane convoy escort. Machines were to keep close to the convoy, keeping a good watch out for periscopes, and were instructed to immediately make signals (by Very lights), if a U-boat were spotted.²³⁵ Seaplanes, due to the limited crew comforts available, were not to stay aloft for more than about three hours, whereas flying boats, with larger crews, could stay flying for from four to six hours.²³⁶ Convoy cover was to be flown in a series of rotating patrols, each seaplane staggered to arrive over the convoy as the previous escort was completing its patrol. All aircraft involved were to be fitted both with W/T and also Aldis lamps for signaling. The latter were also to be carried by the ships escorting the convoy as 'experience has shown that in this work a ship's searchlight is almost useless.'²³⁷

Communication was a central focus, the manual stipulating that pilots and observers alike should be 'thoroughly acquainted with all Very's [sic] Lights Signals, etc., all recognition signals and marks, as used by British submarines and surface craft.' Knowledge of current signals was doubly important to prevent the enemy from gaining knowledge of signaling and to prevent friendly fire.²³⁸ Again, this requirement clearly demonstrated the need for highly trained specialists, both naval pilots and observers, within the RAF.²³⁹ The manual encouraged seaplanes to use the sun to tactical advantage, thus to keep station between the sun and the convoy to improve visibility. Further, a special pair of 'submarine goggles' were supplied to the airplane's crew that were designed to cause a submarine's 'periscope to show up bright red' for further improved spotting.²⁴⁰ Pilots were reminded that these colour filtered goggles were imperative, considering that '...hostile submarines are very carefully camouflaged' and thus difficult to detect otherwise.²⁴¹ Although published after the war, in December 1918, the manual provides a glimpse into the fully developed Air Division methods.

²³⁴ Abbatiello, 'British Naval Aviation', p. 168. Notes on the Co-operation of Aircraft with Surface Craft for Escorting Convoys of Merchant Ships, AIR 1/2321/223/41/885. Abbatiello, *Anti-Submarine Warfare*, pp. 111-12. Pulsipher, 'Aircraft and the Royal Navy', p. 306, also in AIR 10/860.

²³⁵ Notes on the Co-operation of Aircraft with surface craft for Escorting Convoys of Merchant Ships, Air Division, Naval Staff, December 1918, AIR 10/860, p. 1.

²³⁶ Ibid, p. 5.

²³⁷ Ibid, p. 6.

²³⁸ Flight Commander P. Holmes, report of patrol in H12 No. 8661, Felixstowe, 30 April 1917, ADM 1/8486/82.

²³⁹ Ibid, p. 11.

²⁴⁰ Ibid, p. 9.

²⁴¹ Ibid, p. 8.

The Air Division, alongside Williamson's Air Section of the ASD,²⁴² thus became clearing houses for useful publications and memorandum that were passed up the chain from the districts and fleet commanders. The Air Division was specifically tasked with the study of all A/S methods used by the regional air groups. As with Williamson's ASR monthly operational tabulations, the Air Division now published 'Reports of Naval Air Operations,' fulfilling the same function of compiling operational reports to elucidate best practices for publication and distribution.²⁴³

The Air Division oversaw all naval air matters, regardless of theatre, and was responsible for networking between the stations in Britain, on the continent, and in Mediterranean. For example at Malta it was planned to station Large America boats plus non-rigid Sea Scout airships as part of a broad A/S scheme for the Mediterranean.²⁴⁴ SNO Egypt possessed an air complement stationed at Alexandria, but the entire flying boat programme remained focused at Malta, and none could be spared for the C-in-C Mediterranean when he requested support at the beginning of March 1918.²⁴⁵ Indeed Arthur Longmore, formerly of No. 1 Squadron RNAS at Dunkirk until the Americans took over and now relocated to Taranto, believed at least a dozen flying boats were needed to supplement the twelve seaplanes stationed at Alexandria which were of limited use.²⁴⁶ On 22 May the Egyptian units were reorganised into their own regional group, comprised of the Port Said Seaplane Station, Alexandria NAS, No. 2 Balloon base, and HMS *City of Oxford*.²⁴⁷

Even farther abroad Royal Navy seaplane carriers were carrying out A/S missions, such as HMS *Orotava* that carried out seaplane patrols at Dakar, Senegal, in conjunction with French forces, from 24 October until 25 November 1918.²⁴⁸ On 5 November Lt. V. W. Lamb, RAF, took Short 184, N2816, with Lieutenant N. J. Picken, RAF, as observer up to patrol the Dakar

²⁴² June 1917, Black, *British Naval Staff*, p. 197.

²⁴³ Abbatiello, 'British Naval Aviation', p. 145. See also, Air Division, 'Reports of Naval Air Operations', AIR 1/626/17/59.

²⁴⁴ Air Division, RNAS, F. E. Boats landing at Malta, re. inspection and acceptance of 5 March 1918, AIR 1/273.

²⁴⁵ F. R. Scarlett, DAD, Seaplane Station, Alexandria, 6 March 1918, AIR 1/273.

²⁴⁶ The British C.in.C. Mediterranean, Seaplane Base at Alexandria, 9 March 1918, AD37, AIR 1/273.

²⁴⁷ Lt. Col. Norman Leslie to Director Air Organisation, No. 64 Wing has been activated, 28 May 1918, AD 37, AIR 1/273.

²⁴⁸ Lt. Vernon W. Lamb, CO HMS *Orotava*, report of operations at Dakar, November 23 1918, AD49, AIR 1/273. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 223.

harbour, armed with 330 lbs of bombs.²⁴⁹ On 9 November they escorted a convoy led by HMS *Ebro*, scouting the surrounding area and route ahead.²⁵⁰ A total of four A/S patrols were conducted by *Orotava* during this timeframe, although no submarines were spotted at this concluding phase of the war.²⁵¹ HMS *Mantua* was also carrying out similar operations and both ships were part of the far-ranging Plymouth command that included Dakar and the Azores.²⁵² The attachment of seaplane carriers such as *Riviera*, *Orotava*, *City of Oxford*, *Mantua*, to the regional commands represented a precursor to the escort carrier, dramatically increasing the ability of commanders to supply local air support to the convoys on distant stations.

By June 1918 it was not unusual for an airplane to attack an enemy submarine with bombs and report by W/T for destroyer support, such that any submarine surviving a bombing attack had to assume that it would be further persecuted unless it rapidly vacated the area.²⁵³ The Blackburn Kangaroo, introduced in spring 1918 and endorsed by Williamson, who contributed to the design, was the most successful coastal patrol aircraft of the war, despite only 17 being built by the armistice. Kangaroos sighted 12 submarines over 600 hours of flying between April and November 1918, or one sighting every 50 hours. These figures compared favourably with one per 196 hours for Large America flying boats, and one per 2,416 hours for coastal airships.²⁵⁴ Based on Sturtivant and Page's figures, a single 520 lb bomb and at least 16 230 lbs bombs were dropped on submarines by Kangaroos during 1918, but the only recognized sinking was against *UC70*, with the assistance of a nearby destroyer.²⁵⁵

After April 1918 there was significant continuity between the former naval squadrons and the Admiralty: the Air Division of the Staff now resembled the former Admiralty Air Department, while the RAF squadrons retained the RNAS regional group structure.²⁵⁶ The Admiralty was keen to reiterate the importance of communication and cooperation in a policy

²⁴⁹ Lt. V. W. Lamb, RAF, patrol report of seaplane attached to HMS *Orotava* at Dakar, 5 November 1918, AIR 1/273.

²⁵⁰ Lt. V. W. Lamb, RAF, patrol report of seaplane attached to HMS *Orotava* at Dakar, 9 November 1918, AIR 1/273.

²⁵¹ Lieutenant V. W. Lamb, RAF, CO HMS *Orotava*, report on operations to Director Air Division, 23 November 1918, AD49, AIR 1/273.

²⁵² Director Air Division to C-in-C Plymouth, 1 October 1918, AD 49, ADM 1/273.

²⁵³ Extracts of Information received from Air Stations of Operations by Royal Air Force Contingents from 13th June to 16th June 1918, Operations from Killingholme, AIR 1/296, p. 3.

²⁵⁴ Jones, *WIA*, vol. VI, p. 334, cited in Pulsipher, 'Aircraft and the Royal Navy', p. 298fn.

²⁵⁵ Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, p. 356.

²⁵⁶ Jones, *WIA*, vol. VI, p. 334.

statement produced also released in April, emphasizing that the air groups were to be in telephone contact with both the SNOs and air stations.²⁵⁷ Airships and kite-balloons would provide the essential convoy escort function, backed by patrolling airplanes and a special hunter-killer squadron dedicated to rapid response to enemy submarine activity.²⁵⁸ Flying boats, capable of landing and deploying hydrophones, were expected also to provide a listening capability and to engage in patrol and convoy activity farther from the coast.²⁵⁹ An enormous building programme of more than 1,000 aircraft was recommended, including flying boats, seaplanes, and specially designed coastal aircraft such as the Kangaroo.²⁶⁰

The creation of the RAF, in particular the Independent Force, had a negative impact on the procurement of aircraft for the A/S role. Handley Page bombers flying from Redcar that were briefly used for ASW 'with conspicuous success' were instead transferred to strategic bombing operations in France.²⁶¹ The Air Ministry preferred to supply the RNAS with DH6 trainers over the more useful DH4 bombers.²⁶² Similar procurement issues were experienced with regard to flying boats: between November 1917 and February 1918 the Air Board had promised the delivery of 63 Large America type flying boats, but only 20 were actually delivered.²⁶³ The bitter truth is that the RAF was not fully aware of the importance of the A/S mission, preferring instead to focus on local air defence and strategic bombing rather than the naval mission. It was for this reason that the creation of the RAF, despite the change in uniforms and ranks, had at first almost no impact on the established RNAS policy, although the situation soon changed. The debate around priority, which missions deserved the most resources and why, was to be repeated in the next war.²⁶⁴

²⁵⁷ Ibid.

²⁵⁸ Ibid.

²⁵⁹ Ibid, p. 335.

²⁶⁰ Ibid, pp. 336-7, 340.

²⁶¹ Pulsipher, 'Aircraft and the Royal Navy' p. 299. Air Department, Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts, 30 March 1918, AIR 1/279/15/226/133, p. 4.

²⁶² Pulsipher, 'Aircraft and the Royal Navy', p. 300.

²⁶³ Air Department. Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts, 30 March 1918, AIR 1/279/15/226/133, p. 3.

²⁶⁴ Tim Benbow, 'Brothers in Arms: The Admiralty, the Air Ministry, and the Battle of the Atlantic, 1940-1943,' in *Global War Studies*, vol. 11, no. 1 (2014), pp. 41-88.

The arrival of US Naval aviation prompted the RAF to redeploy, and Dunkirk was abandoned to the Americans. On 20 July, Killingholme was handed over to the USN with another four bases in Ireland transferred in September.²⁶⁵

Conclusion

From its creation as the Naval Wing of the Royal Flying Corps, aerial ASW was expected to be a component of Britain's naval aviation mission. The extent of this role was at first limited by strategic confusion and budget cuts in 1914, indeed, the Air Department had been caught off guard. In January 1914 Churchill and Sueter had agreed, for budgetary reasons, to postpone their modernization campaign until 1916-1917, leaving the entire budget for 1915-1916 at only £780,000 to £815,000.²⁶⁶ In this proposed budget new construction consumed 58% of the budget for the first two years, with general works consuming another £200,000 and stores and general pay less than £100,000 each.²⁶⁷ These figures are significant as they suggest that the Admiralty was planning to cap Air Department spending at around £1 million for the years 1914-1917, with a total 1914 expenditure of £988,450, matching that of Germany or France, but also not much more than the cost of a pair of new light-cruisers, all told. The result was an intentional short-changing of the Air Department for 1915, that could be said to have backfired on Churchill's administration when the war broke out.

Early wartime efforts to bomb the submarine bases were generally not successful. The U-boats, although deterred from carrying out attacks on merchant shipping by international pressure, continued to attack warships. Combined with the mass scale mine warfare both sides engaged in, the U-boats scored a number of critical successes in 1914, 1915 and 1916. During this period of relative restraint the focus, despite increasing shipping losses, was always conditioned by the position of the United States and other neutrals. Between August 1914 and May 1916, total shipping destroyed by enemy action never exceeded 200,000 tons a month, while tonnage destroyed by submarines crossed 100,000 tons for the first time in May 1915, the month the *Lusitania* was sunk, and then peaked in August 1915, when the sinking of *Arabic* prompted further American protest. After a significant decline, 140,000 tons were sunk by

²⁶⁵ Abbatiello, 'British Naval Aviation', p. 186. Rossano, *Stalking the U-Boat*, p. 125.

²⁶⁶ Director Air Department, Air Service Estimates, 22 January 1914, AIR 1/2440.

²⁶⁷ Ibid.

submarine in November 1915, a figure not approached again until March 1916, when the campaign was once more curtailed by international protest. In April 1916 the U-boats were withdrawn to work with the fleet in the upcoming surface actions.²⁶⁸ Combined with the warships destroyed by submarines and mines, these figures solidified the submarine's position as a coastal raider and fleet auxiliary; they did not, however, represent a serious threat to the Allied war effort. Although the warship losses were serious, targets were more often than not obsolescent ships and shipping losses were soon replaced by new production.

The situation began to change in 1917 when Admiral Jellicoe was transferred from the Grand Fleet and installed as First Sea Lord. Germany initiated the crisis in February by unleashing the U-boats to attack all merchant shipping, regardless of the impact that this would have on neutral governments. The United States promptly declared war on 6 April 1917, despite President Wilson's 1916 election year promise to keep the US out of the war.

The solution was to introduce more effective methods and equipment, and then to assemble the most critical merchant and supply ships in protected convoys. The explanation of why this was not done earlier is too lengthy to explore here, however, it can be said that the experience of the RNAS supported the decision. Patrolling potentially empty ocean was draining on both morale and aircraft parts and, with a few exceptions, yielded only limited concrete results. After the initial success of the flying boats in April and May 1917 the U-boat commanders adapted and the patrols became less effective. Providing air cover for a convoy conserved sorties and increased the chances of success. As would be expected in February 1917, the decentralized districts had in fact carried out convoy operations in some cases, the Channel crossing being a notable example. What was needed was twofold: a scheme that encompassed the entire shipping situation, cross departmental in nature, and the capacity to implement that scheme. Without central direction it was left to the districts to set policy individually or unite together organically, encouraged by the RNAS commanders over whose districts they flew, as was demonstrated by the C-in-C East Coast of England, and at the Dover Patrol which was in fact a prototype air group, covering Dover and Dunkirk NAS.

Jellicoe eventually solved both problems. His solution was to appoint chiefs from amongst the districts, effectively creating regional commands in which the RNAS wings were

²⁶⁸ Fig 2.3. British, Allied and neutral merchant vessels destroyed by enemy action, 4 August 1914 – 31 May 1916, Redford and Grove, *The Royal Navy*, p. 63.

now under the leadership of a group commander or RNAS Wing Captain. The new flying boats, improved seaplanes, airplane bombers and fighters, as well as rigid and non-rigid airships improved the effectiveness of the Navy's counter-submarine strategy. At this point the Allied material advantage became more evident, as wide scale air patrols, expanded bombing of submarine bases, and aircraft support for merchant convoys proved a potent tonic in the struggle against the U-boats.

The Churchill and Fisher administration treated the RNAS as a technical think-tank, but also as a military branch within the Royal Navy, like the Coast Guard or Royal Marines - an inestimable maritime resource. By September 1915 this regime had been replaced with Balfour-Jackson and Rear-Admiral Vaughan-Lee, a more conservative administration that loosened the Air Department's central control over the RNAS squadrons and stations, abandoned the overland air defence of Britain, and started to conduct long-distance bombing against German industry in an evolution of the Navy's blockade doctrine. Balfour's reforms put the RNAS Squadrons at the service of their district SNOs, but also isolated those districts into individual commands, thus limiting the transmission of experiential learning between commands, although some of the stove-pipe nature of the Churchill regime was retained. In 1917 First Lord of the Admiralty Sir Edward Carson, First Sea Lord Jellicoe and Fifth Sea Lord Godfrey Paine now brought the RNAS squadrons and stations together as part of group commands, tasking the regional commanders with solving the problem of coastal defence and shipping protection collectively. Lessons learned would be referred to the Naval Staff for accumulation, distillation and distribution. The First Sea Lord, after May 1917 also the CNS, would direct specialized missions as required, such as the planning for the Wilhelmshaven attack proposed in the fall of 1917, the ultimate objective of which was to get access to the Belgian submarine bases. First Lord Carson was soon dismissed by Lloyd George and replaced by Eric Geddes, previously the navy's Controller. Geddes could no longer work with the overworked technocrat Jellicoe, who was thus replaced by the more palatable Admiral Rosslyn Wemyss in late December 1917. Geddes served to oversee the dismantling of the RNAS, which forced the Admiralty to rely on the Air Division of the Naval Staff.

Although the use of aircraft for ASW had been explored before the war, the experimental and theoretical work had not prepared the RNAS to carry out the mission on a mass scale. The lack of pre-war experience, combined with the RN's decentralized approach to its naval aviation

assets after June 1915, resulted in little unity of effort: each district, squadron, and the various service leaders all produced different, and sometimes conflicting, proposals about where, and how best, to utilize naval aviation for the protection of merchant shipping and ASW more generally.

The significance of the RNAS in the A/S role was summarized by Abbatiello who quoted the Barley and Waters post-war staff study to the effect that ‘during the unrestricted submarine campaign only 257 out of 83,958 ships (of over 500 tons) [that] sailed under convoy escort were lost to U-boats in Home Waters. Out of 1,757 total losses during the period, the vast majority (1,500 or 86%) occurred when ships sailed independently’, and thus without convoy or air support.²⁶⁹ During 1918 the Admiralty observed only six occasions in which U-boats attacked convoys escorted by both air and surface assets.²⁷⁰ On the other hand, Air Ministry figures indicate that despite RAF efforts, between 1 July and 30 September 1918, 329 attacks were carried out against un-convoyed merchant shipping by submarines even when airplanes and airships were operating with No. 9, No. 10, and No. 18 Groups, so aircraft clearly worked best as part of the total system.²⁷¹ Layman concluded that RNAS efforts, in terms of sea lane defence, are best appreciated for their strategic, rather than immediate tactical impact, considering the limited number of successful A/S attacks relative to the enormous air effort.²⁷²

Lastly, throughout the war the influence of Commander Hugh Williamson was felt. An innovative pre-war theorist, Williamson contributed to a number of important technical projects and went on to command the Air Section of the ASD, thus providing a wealth of material that contributed to the development of a tactical and strategic A/S naval aviation doctrine. Furthermore, the interaction between the Naval Staff and the Board of Admiralty (with Commodore Paine as Fifth Sea Lord) did much to restructure the relationship between the RNAS station commanders and the Naval district officers under whom they served. Although the situation after the May Crisis was never as straightforward as it had been before it, the system did eventually evolve to a high degree of efficiency, certainly more rational after Jellicoe than the Air Department had been before his appointment as First Sea Lord.

²⁶⁹ Abbatiello, ‘British Naval Aviation’ p. 163.

²⁷⁰ Abbatiello, *Anti-submarine Warfare*, p. 108.

²⁷¹ Appendix XVIII, Comparison of Anti-Submarine Flying Operations Between Groups Nos. 9, 10, and 18 from 1st July 1918 to 30th September 1918, Jones, *WIA*, Appendices, p. 88.

²⁷² Layman, *Naval Aviation*, p. 88.

Despite the limited tactical successes of 1917-1918, the war experience seemed to demonstrate that ‘the only rival of the submarine patrol is the aircraft patrol’.²⁷³ Unfortunately, this was only part of the story, and the hard lessons learned between 1914-1918, in particular the successes of the RNAS and RAF when combined with merchant convoys to defeat the U-boats, would have to be re-learned in the Second World War.²⁷⁴

²⁷³ King-Hall, ‘The Influence of the Submarine in the Naval Warfare of the Future’, p. 369.

²⁷⁴ Goulter, ‘Royal Naval Air Service’, p. 51.

Chapter Five: Long-Range Bombing

This chapter examines the contribution of the RNAS to the origin of long-range bombing. Four examples are presented, covering key watersheds that are representative of RNAS bombing operations during the war. First, the pioneering 1914 anti-Zeppelin base raids are examined, missions that included the first air raid conducted against a factory. Second, the operations and administration of the Dunkirk Wing are considered, the first systematic RNAS bombing program targeting Germany's bases, communications, aerodromes and docks along the Belgian coast. Third, the chapter focuses on the formation and operation of RNAS No. 3 Wing, the much maligned naval air organisation dedicated to bombing industrial targets in Germany. Fourth, the history of RNAS No. 16 Squadron, that became an integral component of the RFC's long-range bombing campaign in October 1917, and went on to become a formative component of the RAF's Independent Air Force (IAF) in June 1918.¹ These four examples cover the breadth of the RNAS involvement with long-range bombing.

These different long-range bombing campaigns are representative of the general development of the RNAS itself: transitioning from an *ad hoc* organisation to a sustained force. The Air Department, through No. 3 Wing, staked a claim to the origins of airpower itself through the long-range bombing of Germany's industry, a project that Neville Jones described as 'the boldest, and perhaps the most successful, experiment in the use of air power during the war'.² The first true reprisal raids were also carried out by No. 3 Wing, demonstrating the versatility of long-range bombing prior to the Wing's abandonment due to changing wartime priorities and increased inter-service tension. Unfortunately for the Navy's control of long-range bombing, rivalry with the RFC for control of aeroplane engine supply generated a systematic effort to cripple and dismantle No. 3 Wing, actually accomplished by March 1917. When Germany's Gotha raids commenced in June 1917 it quickly became apparent that dismantling No. 3 Wing had been an error. It was not until October that another long-range bombing force could be assembled to retaliate, this time as the 41st Wing, RFC, to which the Air Department contributed No. 16 Squadron. Taken as a whole the chapter provides a perspective on the development of strategic airpower that is rarely examined, given the dominance of the RFC in the historiography.

¹ Ash, *Sykes and the Air Revolution*, p. 6.

² Jones, *Origins of Strategic Bombing*, p. 107.

Certainly this chapter represents the most contentious point in the history of RNAS - RFC relations. The fact that the RNAS had developed and executed long-range bombing - indeed, had pioneered the very concept of bombing against Zeppelin sheds, naval bases, rail lines, industrial targets and city centres - was quietly forgotten, not least by the RAF. The War Office, in its effort to stop the Navy's bombing program, and thereby secure for the RFC the entirety of available aviation resources, ultimately proved so successful that it opened the door for the Third Service, stripping both Army and Navy of control of their airpower altogether.

Churchill and the Anti-Zeppelin Raids of 1914

Within little more than month of its formation in July 1914 the RNAS put into practice a bold plan to counter the Zeppelins through an aerial bombing offensive targeting Germany's airship bases. The RNAS acted in the capacity of raiders, conducting airplane and seaplane strikes against Germany's Zeppelin sheds and factories. These pioneering efforts represented the first foundation stones of what would eventually evolve into a comprehensive program of RNAS bombing.

For First Lord Churchill, the RNAS offered a way to overcome the one-sided German rigid airship advantage. Bombing the Zeppelin bases from the air, given the great difficulty of intercepting and destroying Zeppelins while in flight, was the only sure means of reducing the enemy's airship force.³ Zeppelin sheds, filled with explosive hydrogen and other compressed gases, represented ideal targets for the pioneering RNAS bombers. Commander Samson, Churchill's primary RNAS practitioner and a champion of close-air-support, recalled in his memoirs the 22 September 1914 raid from Antwerp against Dusseldorf, in which Lieutenant Collet managed to drop bombs near a Zeppelin shed, although he missed his primary target.⁴ On 9 October a second raid against Dusseldorf was carried out by the Antwerp squadron. This time Lt. Marix successfully destroyed Zeppelin LZ9 in its shed, a stunning early success.⁵ The next month the Friedrichshafen raid was conducted, the earliest example of an air raid with the explicit purpose of targeting an industrial centre, in this case the Zeppelin factory at

³ Goulter, 'Royal Naval Air Service', p. 56. Pulsipher, 'Aircraft and the Royal Navy', p. 313.

⁴ Samson, *Fights and Flights*, pp. 52-3.

⁵ Pulsipher, 'Aircraft and the Royal Navy', p. 312. Sturtivant, *British Naval Aviation*, Appendix I, p. 215. Popham, *Into Wind*, p. 17.

Friedrichshafen on the Swiss border.⁶ *L7* was almost hit during this raid.⁷ Cologne, another Zeppelin base, was bombed in November, and this was followed up by the seaplane strike against the Cuxhaven sheds by the Harwich Force on Christmas Day 1914.⁸ Although these raids were in keeping with the Royal Navy's attack at source tradition, embodied by numerous examples from Drake to Cochrane, they were also, in no small measure extraordinarily dangerous, making these attacks at best irregular strikes rather than systematic operations.⁹

DAD Sueter also assumed the air power mantle and, with Commander Samson's assistance, organised a mass raid against the Ostend docks, targeting guns, railways and harbour vessels. Sueter took personal command of the raid, utilizing aircraft from five bases plus HMS *Empress*. Originally planned for 11 February 1915, due to poor weather the raid was delayed until the following morning. Taking advantage of newly delivered 65 lb and 100 lb bombs, a total package of 1,820 lbs was dropped on the enemy's docks.¹⁰ A repeat raid four days later resulted in the loss of four pilots, but it was judged that considerable damage had been inflicted upon the target.¹¹ Due to unfavourable weather conditions - and the re-allocation of forces to the Dardanelles - these dangerous bombing missions were suspended until Flight Sub-Lieutenant Warneford's unsuccessful attack against the Gontrode Zeppelin sheds on 25 May. Another attack by Flight Lieutenants Wilson and Mills against Evere on 7 June succeeded, destroying *LZ38* in its shed.¹²

Beginning in January 1915 the Zeppelins were assembled into raiding groups and gradually unleashed on the East Coast of Britain. Churchill planned to retaliate and in April introduced plans for the construction of heavy bombing aircraft.¹³ At a conference held by the First Lord early that month, with the Dardanelles crisis unfolding in the background, Churchill committed the Air Department to the development of a 'heavy bomb-dropping type' of airplane

⁶ Raleigh, *WIA*, vol. I, pp. 395-7. Layman, *Naval Aviation*, pp. 67-8.

⁷ The operation was led by Lt. Noel Pemberton Billing, later the founder of Supermarine and Independent MP 1916-21, generally a critic of government aviation policy. See also Brock and Brock, *Letters to Venetia Stanley*, p. 319fn. Raleigh, *WIA*, vol. I, pp. 395-6. Layman, *Naval Aviation*, p. 68.

⁸ Massie, *Castles of Steel*, pp. 361-74. Eric Grove, *The Royal Navy since 1815* (New York: Palgrave Macmillan, 2005), pp. 117-118. Raleigh, *WIA*, vol. I, p. 369. Belafi, *The Zeppelin*, p. 333.

⁹ Gardiner, *The Flatpack Bombers*, Introduction, loc. 289.

¹⁰ Samson, *Fights and Flights*, p. 199. Bacon, *The Dover Patrol*, vol. I, p. 219.

¹¹ Abbatiello, 'British Naval Aviation', p. 102. Samson, *Fights and Flights*, p. 195.

¹² Cole and Cheesman, *Air Defence of Britain*, pp. 15, 53. Raleigh, *WIA*, vol. I, pp. 396-400. Jones, *WIA*, vol. II, pp. 350-2. Malcolm Cooper, 'The British Experience of Strategic Bombing,' in *CCIJ*, vol. 17, no. 2 (Summer 1986), p. 50. Bacon, *Dover Patrol*, vol. I, p. 224.

¹³ Pugh, 'Conceptual Origins of the Control of the Air', p. 301.

capable of carrying upwards of 500 lbs of ordnance.¹⁴ This was part of Churchill's radical plan to deliver 'smashing blows' against the enemy's material resources.¹⁵ In the decisive turning point of the Mary Crisis, however, Churchill was soon out of office. Commodore Sueter was himself subsequently sidelined to the position of SAC in September, but this did not herald the end of long-range bombing efforts. Churchill had adhered to his aggressive naval aviation policy until he was compelled to resign, leaving Sueter and his chief assistant Captain Vyvyan to carry on the project.¹⁶

From the outset of the war the RNAS advanced the technical and theoretical aspects of offensive aeronautics, including reconnaissance, fighting and bombing. The RNAS developed bombsights and aircraft navigation instruments, in addition to new ordnance itself.¹⁷ Control was exercised primarily from the Air Department, through which orders and information flowed directly to the naval squadrons, air stations and seaplane carrier commanders. At this early stage of the war the RNAS, although it was spread across several theatres, possessed a respectable concentration at Dunkirk. There No. 1 Wing, under Commander Arthur Longmore, was tasked with missions that included air defence, attack of the enemy's surface craft, anti-Zeppelin operations, ASW, and the bombing of German naval facilities directly. This was a significant task, of which the purpose was more tactical and operational than strategic. However, it was the experience gained by the Dunkirk Wing that enabled the development of industrial bombing during 1916.

The Dunkirk Wing and Long-Range Bombing in Belgium

In the taxonomy of the Air Department's wide-ranging operations, RNAS Dunkirk ranked first in size and importance. The numerous aerodromes around Dunkirk provided ample capacity for RNAS wings and squadrons, and routine patrols were carried out to counter both the submarine and Zeppelin threats (see Chapters Four and Six). Less well appreciated is the extent to which RNAS Dunkirk was a staging ground for bombing of the enemy's railroads, aerodromes, and naval bases. The Dunkirk aerodromes originated with the RNAS deployment to Belgium,

¹⁴ Extracts from Minutes of a Conference held in the Admiralty on 3 April 1915, ADM 1/8497, #64 in Roskill, *Documents*, pp. 198-9. See also, Pugh, 'The Conceptual Origins of the Control of the Air,' p. 301. Goulter, 'Royal Naval Air Service', p. 57.

¹⁵ Goulter, 'Royal Naval Air Service', p. 57.

¹⁶ Martin Gilbert, *The Challenge of War*, pp. 445-66.

¹⁷ *Ibid*, p. 57.

originally moved between Antwerp and Ostend before arriving at Dunkirk during Commander Samson's continental campaign in 1914. When Samson deployed to the Dardanelles, Squadron Commander Arthur Longmore and his No. 1 Wing took over the Dunkirk responsibilities. The entire establishment was placed in the same district as the Dover Patrol, and thus came under the command of the C-in-C Dover.

After Rear-Admiral Hood departed for the Battle Cruiser Squadron in April 1915, command of the Dover Patrol was given to Rear-Admiral Reginald Bacon. Bacon came out of retirement to take the post, and for his trouble was promoted to Vice-Admiral that July.¹⁸ Bacon, a torpedo and undersea warfare specialist and one of Admiral John Fisher's many followers, was committed to the development and expansion of the Dover barrage. His policy involved the construction of a series of warning nets laid across the Channel narrows, supported by liberal minefields, patrolled routes, monitors and submarines.¹⁹

Bacon's air support would be provided by Captain Charles L. Lambe. Acting Wing Captain Lambe had been appointed in August to what was expected to be a Coast Guard-like assignment: Lambe would be in overall command of the RNAS forces working with the Dover Patrol and at Dunkirk. Lambe had been given this assignment following their Lordship's displeasure resulting from the loss of HMS *Hermes*, the RNAS parent ship having been torpedoed by *U27* on 31 October 1914 while crossing the English channel under Lambe's command.²⁰

Lambe had known Reginald Bacon for some time, the two had pursued specialist education at Portsmouth, which was then the location of the HMS *Vernon* torpedo school during the 1890s, and both had partaken in the notorious gunboat expedition to Benin, Nigeria, under Rear-Admiral Rawson in February 1897.²¹ Commander Bacon at that time was aboard HMS *Theseus* under Captain Campbell.²² Also with Bacon aboard *Theseus* was Lieutenant Arthur Vyvyan, 20 years old, who landed with the shore-party of 540 Royal Marines and naval

¹⁸ Service record of Reginald H. S. Bacon, ADM 196/87/95.

¹⁹ Marder, *FDSF*, vol. II, p. 353.

²⁰ C. L. Lambe Service Record, ADM 196/44, p. 105. Layman, *Before the Aircraft Carrier*, p. 37. Abbatiello, *Anti-Submarine Warfare*, p. 63.

²¹ Ian Hernon, *Britain's Forgotten Wars: Colonial Campaigns of the 19th Century* (Stroud: Sutton Publishing, 2007), pp. 415-22. L. G. C. Laughton and Andrew Lambert, 'Rawson, Sir Harry Holdsworth (1843-1910), Naval Officer,' *ODNB*.

²² Abbatiello, 'British Naval Aviation and the Anti-Submarine Campaign' p. 104. Reginald Bacon, *Benin, The City of Blood*, Kindle ebook (London: Arnold, 1897), chapter 6, loc. 630.

officers.²³ Sub-Lieutenant Lambe, for his part, was acting commander of the 850 ton screw gunboat *Magpie*.²⁴ After recapturing Benin, and receiving the Queen's telegram of thanks,²⁵ Vyvyan, Lambe, and Bacon all moved on to careers working with the RNAS.²⁶ When Lambe assumed command of the Dover and Dunkirk RNAS forces in August 1915 he had a total of eight squadrons under his command.²⁷ Wing Commander Arthur Longmore's No. 1 Wing was flown over to Dunkirk on 26 February 1915 and included Squadron Commanders Rathbone and Courtney.²⁸

In June 1915 First Lord of the Admiralty Balfour confronted a situation in which resources were limited and the RNAS was spread over several fronts, carrying out simultaneous A/S patrols, air defence and gunfire spotting missions. As a result of these intensive commitments, Wing Captain Lambe's belief in a prioritized bombing policy was optimistic. The new Handley Page bombers, like the first tanks and flying boats, were still in the developmental stage, more than a year away from active service, and the RNAS had to make-do with the Sopwith 1½ Strutter, a two-seat bomber that could be modified to carry up to 260 lbs of bombs, if the observer's position were abandoned. The Strutters were powered by a 130 hp French made Clerget engine and armed with 500 rounds for the Vickers gun, synchronized by an RNAS Scarff-Dibovsky gear.²⁹

Most of the bombing carried out by the end of 1916 had been tactical or operational in nature. Between March and June 1915, for example, the RNAS, RFC and French air force at Dunkirk dropped 4,062 bombs during 483 raids. Of these raids only 35, or 7%, were carried out against 'ammunition depots, factories, power stations and ship-building yards,' with a handful of successes. Other targets included railway junctions, but only three of 141 such attacks were judged to have been successful.³⁰

²³ *The Naval Who's Who, 1917*, p. 154.

²⁴ A. B. Sainsbury, 'Bacon, Sir Reginald Hugh Spencer (1863-1947),' *ODNB. The Naval Who's Who, 1917* (Polstead: J. B. Hayward & Son, 1981), p. 93. Bacon, *The City of Blood*, loc. 972. Colledge and Warlow, *Ships of the Royal Navy*, p. 212.

²⁵ 'The Queen And The Benin Expedition,' 2 March 1897, *London Times*, p. 5.

²⁶ Marder, *FDSF*, vol IV, p. 315. Abbatiello, *Anti-Submarine Warfare*, p. 63. Service record of Arthur V. Vyvyan, ADM 196/89/161 & ADM 196/141/286.

²⁷ Abbatiello, *Anti-Submarine Warfare*, p. 63.

²⁸ Arthur Longmore, RN and RAF: 1911 to 1945, part II, RAF Museum Hendon, DC 74/102/40, p. 7.

²⁹ King, *Armament of British Aircraft*, p. 327. Thetford, *British Naval Aircraft*, p. 221.

³⁰ Cooper, 'The British Experience of Strategic Bombing', p. 50.

In February 1916 the RNAS returned responsibility for the air defence of Britain to the RFC (see Chapter Six), which meant a windfall of resources for reallocation to offensive operations. DAS Vaughan-Lee approved the expansion of Dunkirk to a total of three wings (120 machines and 72 pilots total) in March 1916, with one of those wing specifically designated for bombing. The objectives of the force under Lambe's command now included targets such as 'canal locks, bridges, railway stations, airship sheds, and aerodromes' - these were operational targets prioritized by the RNAS and RFC as opposed to missions of a strategic nature.³¹

The increasingly land oriented character of RNAS Dunkirk did not escape the notice of the Fourth Sea Lord, Commodore Lambert, or the Second Sea Lord, Vice-Admiral Hamilton, who disapproved of Vaughan-Lee's plan to expand RNAS Dunkirk, citing the exposure of the urban areas to potential enemy attack.³² Vice-Admiral Bacon for his part was not convinced that independent bombing operations would be useful to the Navy.³³ In June 1916, at Bacon's request, bombing operations were suspended altogether.³⁴ Lambe authorized the bombing of Ghistelles aerodrome early in September, specifically to support operations at the Somme,³⁵ and in December agreed to transfer resources to the War Office in support of the RFC on the Western Front.³⁶

As German naval activity increased over the summer and fall of 1916 Bacon re-authorized limited bombing raids against Ostende and Zeebrugge.³⁷ Jellicoe, perhaps not surprisingly, accelerated this policy, and Bruges was re-added to the target list in February 1917.³⁸ Over six tons of bombs were dropped on Ostend, Zeebrugge, Bruges and the Ghent aerodrome by March, when bombing was halted due to poor weather.³⁹ A major reorganisation occurred in April, when DH4 and Handley Page aircraft arrived.⁴⁰ No. 5 Wing was established for day and night bombing, with No. 5 Squadron (DH4) and No. 7 Squadron (Handley Page) in

³¹ Abbatiello, *Anti-Submarine Warfare*, p. 64.

³² Memorandum of Meeting Held in Second Sea Lord's Room, 21 March 1916., ADM 1/8449/39A, p. 2.

³³ Dunn, *Securing The Narrow Sea*, p. 146.

³⁴ Jones, *Origins of Strategic Bombing*, p. 82.

³⁵ Abbatiello, *Anti-Submarine Warfare*, p. 66.

³⁶ Westrop, *A History of No. 6 Squadron*, p. 12.

³⁷ Abbatiello, *Anti-Submarine Warfare*, p. 67.

³⁸ Ibid, p. 68.

³⁹ Ibid.

⁴⁰ Jones, *Origins of Strategic Bombing*, pp. 124-5.

those roles, respectively.⁴¹ Germany's Gotha raids precipitated another policy shift: German aerodromes now became priority targets.⁴²

The question of how the Dunkirk and Dover forces should be employed - against the submarine bases, or other targets - disrupted Lambe's agenda. He dispatched a letter to Bacon on 10 June 1917 expressing his concern that the enemy's concentration of submarines at Bruges, combined with the arrival of aircraft reinforcements, meant that air patrol and A/S missions off the enemy's coast were needed more than ever.⁴³ Lambe proposed replacing the RNAS seaplanes under his command with bombing airplanes, while maintaining steady patrols and raids against Ostende and Zeebrugge. Bacon pointed to the improbability of this scheme given the strong presence of enemy fighter aircraft around Dunkirk. Bacon, in truth, considered an RNAS offensive policy 'useless' unless pursued on a massive scale, a critique that was latter levied by the RFC against industrial bombing operations.⁴⁴ Bacon remained orientated towards the Channel barrage, but he did not stop the bombing missions from taking place once they were resumed in 1917. There was also top-down pressure from the Admiralty regarding the expenditure and effectiveness of the Dunkirk Wing's bombing.⁴⁵ RNAS efforts continued to be diverted away from naval targets by the Passchendaele offensive during September. When combined with an increase in German air force counter-attacks against RNAS aerodromes and improved enemy defences, the ability to carry out long-range bombing was limited.⁴⁶

Statistics kept of the bombing missions demonstrate that bombing was maintained on a fairly significant scale. For example, Zeebrugge was raided 24 times between April and May, with 'over 1,000 bombs, containing thirty tons of explosives' dropped, according to Unionist party leader Bonar Law.⁴⁷ Indeed during 1917 the Dunkirk and Dover forces dropped 334 tons of

⁴¹ No. 5 Wing conducted significant bombing operations during late 1916 and throughout 1917, also cooperating with the RFC on the Western Front. Jones, *WIA*, vol. IV, pp. 81-2. RNAS Dunkirk Report on bombing raid by No. 5 Wing RNAS in cooperation with Royal Flying Corps on Ghistelles Aerodromes, 3 September 1916, AIR 1/633/17/122/87.

⁴² Abbatiello, *Anti-Submarine Warfare*, p. 69.

⁴³ Extracts from Letter H.Q. No. 562 from Wing Captain C. L. Lambe, Commanding R.N. Air Station Dunkirk, to the Vice-Admiral Dover Patrol, dated 10 June 1917, and covering Letter by Vice-Admiral R. H. Bacon to the Admiralty, AIR 1/641, #170 in Roskill, *Documents*, pp. 484-5.

⁴⁴ 'Extracts from Letter H.Q. No.562 from Wing Captain C. L. Lambe, Commanding R.N. Air Station Dunkirk, to the Vice-Admiral Dover Patrol, dated 10 June 1917,' and 'Covering Letter by Vice-Admiral R. H. Bacon to the Admiralty', AIR 1/641, #170 and #171, in Roskill, *Documents*, pp. 484-7.

⁴⁵ Abbatiello, *Anti-Submarine Warfare*, p. 66.

⁴⁶ Ibid, pp. 70-1.

⁴⁷ Statement by Bonar Law, 5 June 1917, HC, vol. 94, cc. 20-30.

munitions, although much less was dropped on naval targets specifically.⁴⁸ Lambe's report admitted that the 1915 and 1916 efforts had not been widely effective, although, raids targeting enemy aerodromes had produced some limited success.⁴⁹

Admiral Keyes and the Offensive Renewed

Vice-Admiral Roger Keyes, formerly Commodore (S) and a veteran staff officer from the Dardanelles, replaced Bacon at the beginning of 1918. Keyes was expected to follow a more aggressive policy than his predecessor, bringing an energetic reputation to the Dover Patrol.⁵⁰ Keyes requested that Lambe provide a report on the bombing efforts to date.⁵¹

In February 1918 the Air Ministry significantly restructured the Dover command to focus on air defence and ASW. Under the new arrangements the Handley Page O/400 squadrons, which Lambe had been using for day and night bombing, were transferred to work with the BEF, although ostensibly remaining under Lambe's command.⁵² Lambe, still pressing for more offensive action, found Keyes someone he could work with.⁵³ Keyes was immediately confronted with the problem of the RNAS role within the broader air offensive, and he protested when Field Marshal Haig received the Dunkirk bombers, aircraft that Keyes had planned to use against the Bruges submarine pens during February.⁵⁴ In March Keyes did propose an expansion of the A/S base bombing effort, but was frustrated when the German Spring Offensive again caused a change in priorities.⁵⁵ Resources were once again reallocated to the front.⁵⁶

The newly established Air Ministry reformed the Lambe's command as No. 5 Group RAF on 16 May 1918.⁵⁷ The longstanding conflict between the Navy's requirements and the Army's requests for support were not resolved by the Air Ministry, with Keyes and Lambe

⁴⁸ Appreciation of British Naval Effort during the War.- Role of the R. N. A. S., 16 January 1919, ADM 1/8549/13, p. 15.

⁴⁹ Abbatiello, *Anti-Submarine Warfare*, p. 118.

⁵⁰ Abbatiello, 'British Naval Aviation', p. 117.

⁵¹ Plans Division: war records, Volume 5, Lambe to Keyes Report, 'The general effects of Offensive Operations carried out by Bomb-dropping in aircraft,' 3 February 1918, ADM 137/2710.

⁵² Abbatiello, 'British Naval Aviation' pp. 118-9.

⁵³ 'Admiralty Letter M.02426 of 23 February 1918 to Air Ministry enclosing Letter No. 9364 of 3 February 1918 from Captain C. L. Lambe, Commanding R.N. Air Station, Dunkirk, to the Vice-Admiral, Dover Patrol.' AIR 1/35, #228 in Roskill, *Documents*, pp. 633-4.

⁵⁴ Ash, *Sir Frederick Sykes*, p. 126.

⁵⁵ Abbatiello, *Anti-Submarine Warfare*, p. 74.

⁵⁶ Abbatiello, 'British Naval Aviation' p. 120.

⁵⁷ *Anti-Submarine Warfare*, p. 75.

continuing to express concern over the situation during May. The Admiralty backed Keyes on 3 May, stating that ‘My Lords are in general agreement with the remarks of the Vice-Admiral, Dover, and are strongly of the opinion that a constant and maintained bombing offensive against enemy submarines, torpedo boats and other craft now accumulating in the Bruges Canal is a matter of the utmost urgency.’⁵⁸

Lambe’s operating orders for 27 May called for No. 5 Group’s bombers to attack the Bruges docks twice a day, by day and night.⁵⁹ After almost three years of back-and-forth, reversals in policy, and numerous requests to support the RFC, Brigadier-General Lambe finally received the go-ahead for his planned mass bombing program. In June 1918 Lambe ordered the DH9 equipped RAF No. 217 squadron, the only dedicated ASW squadron under his command, to attack the Zeebrugge lock gates on a daily basis.⁶⁰ No. 82 Wing, also at Lambe’s disposal, was to focus on anti-shipping attacks.⁶¹ SNO Dunkirk proceeded to carry out intensive bombing operations against the Ostend and Zeebrugge Docks, of which the details are too numerous to reproduce here, but the significance is shown in summary.⁶² Each day between 13 and 19 June, for example, the RAF dropped thousands of pounds of bombs, ranging from 50 to 260 lbs in size, against targets such as Ostend, Zeebrugge, the Bruges docks, Ghistelles aerodrome and railways junctions, in addition to enemy shipping. The target selection is significant as it reflected the constantly changing priorities amongst the RAF and BEF command. As Abbatiello described it ‘Keyes, Haig and Salmond... [were] embroiled in an almost constant exchange of telegrams regarding the trading of squadrons between No. 5 Group and the BEF’s air contingent.’⁶³

Lambe was not going to let administrative territorialism stop his bombing agenda as it was about to achieve fruition. Bruges and Zeebrugge were bombed heavily in May and June with the result that the Bruges electrical works were destroyed and the lock gates at Zeebrugge damaged, the former certainly qualified as a strategic success.⁶⁴ After what can only be described as an inconsistent bombing policy the operations against the port facilities were finally brought

⁵⁸ ‘Admiralty Letter M.04252 of 3 May 1918 to Air Ministry...’ ADM 1/8500, #250 in Roskill, *Documents*, p. 666.

⁵⁹ Abbatiello, ‘British Naval Aviation and the Anti-Submarine Campaign.’ p. 120.

⁶⁰ Lambe to CO 61 Wing, 15 June 1917, AIR 1/58/15/9/62. See also Abbatiello, ‘British Naval Aviation’, p. 122.

⁶¹ Lambe to C. F. Kilnor CO No. 82 wing, 14 August 1918 AIR 1/95/15/9/263. See also Abbatiello, ‘British Naval Aviation’, p. 122.

⁶² Extracts of Information received from Air Stations of Operations by Royal Air Force Contingents from 13th June to 16th June 1918. Operations from Dunkirk, AIR 1/296, p. 1.

⁶³ Abbatiello, *Anti-Submarine Warfare*, p. 75.

⁶⁴ Abbatiello, *Anti-Submarine Warfare*, p. 75.

to a close in September when the RAF transitioned to assisting the general Allied offensive, and the Americans, who had steadily been expanding their bombing capacity since July, took over the Dunkirk operations.⁶⁵ The focus by the RAF on railways and communications had become the basis of the Air Ministry's aerial offensive, exemplified by the work of the IAF discussed below.

The post-war report by Major Erskine Childers and Major E. N. G. Morris reflected poorly on the legacy of the Dunkirk wing's bombing.⁶⁶ The report observed that 1,085 tons of bombs were dropped on German targets between February 1917 and November 1918, of which almost 524 tons were dropped on Zeebrugge, Bruges and Ostend, although only three submarines were damaged by aircraft bombs during the period examined.⁶⁷ Another 280 tons had been dropped on railways, and 130 tons on aerodromes, prominent targets in the final months of the war.⁶⁸

One significant feature of the Dunkirk bombing experience is the divergent perspectives on mission planning as regards the air. Wing Captain Lambe remained in command and dedicated to an expansive bombing program during his entire tenure as commander RNAS Dunkirk Wing, despite his disagreement with Vice-Admiral Bacon about how best to use their naval air assets, a relationship Richmond characterized as 'pettiness'.⁶⁹ It is significant that Lambe still required an ally at the Dover patrol to implement his agenda in an uninterrupted fashion. The experience of the Dunkirk Wing suggests that, without mutual agreement between senior commanders, a long-range bombing program might struggle to ever quite be born. The appointment of Admiral Keyes, more aligned with Lambe than Vice-Admiral Bacon, was a move in the right direction but occurred too late in the war to seriously influence Naval policy: the RNAS ceased to exist less than three months after Keyes' appointment. More important than the material considerations, so much the focus of the Air Board and its successors, was a synergy and consistency of leadership that, if coupled with a clearly defined concept of operations, might have produced more significant results.

⁶⁵ Ibid, pp. 77-8.

⁶⁶ Report of the Aircraft Bombing Committee of Effects of Bombing in Belgium and Enemy Defensive Measures, March 1919, AIR 1/2115/207/56/1. See also Abbatiello, p. 131.

⁶⁷ Abbatiello, *Anti-Submarine Warfare*, pp. 131-2.

⁶⁸ Ibid, p. 131.

⁶⁹ Dunn, *Securing The Narrow Sea*, p. 146. Marder, *Portrait of an Admiral*, p. 245.

Naval Bombing of German Industry, Vaughan-Lee & No. 3 Wing

To explain the origins of the Royal Navy's pioneering industrial bombing effort it is necessary to step back from the Dunkirk forces late in 1918 and to return to the beginning of 1916 when DAS Vaughan-Lee, and his assistant Captain Vyvyan, demonstrated a willingness to maintain Churchill's established offensive policy. The trench lines had stabilised with the failure of the great flanking effort at Ypres in October and November 1914, and in 1915 Churchill's naval offensive at the Dardanelles had not been successful, finally closing down that December. In February 1916 the RNAS turned over responsibility for the air defence of Britain to the RFC, leaving the Air Department with only the Dunkirk wing to carry out offensive bombing. Vaughan-Lee, with support from Vyvyan and Sueter, now desired to expand Churchill's bombing offensive to strike behind the enemy's lines, as the pioneers had done against the Zeppelin bases in 1914.⁷⁰ Rather than simply target enemy bases or communications, however, Vaughan-Lee and Vyvyan now planned to target the enemy's industrial capacity itself. The DAS certainly understood the distinction between the strategic and tactical application of airpower that these long-range operations entailed.⁷¹ Indeed, the DAS had been significantly influenced by Captain Vyvyan but also by the representatives of the French Aviation Department, who proposed an Allied effort to bomb Germany's munitions factories.⁷²

On 28 January DGMA Major-General Sir David Henderson penned a note for the CID suggesting that the War Committee should establish definite boundaries between the responsibilities of the RFC and RNAS.⁷³ He went on to claim that 'long-range offensive operations are being prepared for both services, and there is [a] grave possibility of duplication and consequent waste.'⁷⁴ Less than a month later on 25 February the JWAC was established, and the Air Department put forward its policy statement.⁷⁵ Long-range bombing and specifically the concept of industrial bombing was on Vaughan-Lee's mind as early as 17 February 1916, when

⁷⁰ Cooper, 'The British Experience of Strategic Bombing', p. 51.

⁷¹ Admiralty document on RNAS bombing, 25 February 1916, ADM 1/8449/39A. A. D. Harvey, 'Subjective Impressions in the Archives: Britain's National Archives as a Source for Personal Accounts, and Personal Opinions, of Air Warfare 1914-1918,' in *CCIJ*, vol. 45, no. 3 (Autumn 2014), p. 204.

⁷² History of No. 3 Wing, RNAS, undated, AIR 1/2107/207/42.

⁷³ Major-General Henderson, Duties of the Royal Naval Air Service and the Royal Flying Corps, 28 January 1916, CAB 42/8/2 also CAB 24/2/9. See also Stephen Roskill, *Hankey: Man of Secrets*, vol. I (Annapolis: Naval Institute Press, 1970), p. 251.

⁷⁴ Roskill, *Hankey*, vol. I, p. 251.

⁷⁵ Statement of policy and duties of the Royal Naval Air Service for production at the Joint War Air Committee, 28 February 1916, AIR 2/35.

he wrote to Chief of Staff Oliver that the RNAS should 'develop long distance offensive work as much as possible.'⁷⁶ The DAS reiterated his recommendation on 28 February when he described his plan to use the RNAS to attack Germany's '...naval productive capacity as a whole'.⁷⁷ Vaughan-Lee pressed his case on 3 March,⁷⁸ and again at the meeting three days later when it was agreed that the Navy should move ahead with the long-range bombing program, given that the RFC was incapable of conducting the mission.⁷⁹

Vaughan-Lee again endorsed the importance of 'long distance bombing' in a 15 March memorandum, wherein he revealed more details regarding the project.⁸⁰ It was intended to target steel manufacture in the Saar region, allegedly sourced for U-boat construction.⁸¹ The Sopwith Strutters entering service possessed just enough endurance to make the 240 km, four-and-a-half-hour round trip between Luxeuil-les-Bains and the steel factories and works at Mannheim.⁸²

Vaughan-Lee's recommendations were circulated as the JWAC Interim Report, 20 March, explicitly endorsing long-distance bombing.⁸³ The concept of dockyard, arsenal or air shed attack related more directly to the operations of the Dunkirk wing, however, the inclusion of factories in Vaughan-Lee's policy is significant as dedicated factory bombing foreshadowed the specific mission of No. 3 Wing.

Debate at the Admiralty continued behind closed doors. Vaughan-Lee, Sueter, and Vyvyan, all advocated for an expanded long-range bombing program, and there was general agreement on this matter from Admiralty First Lord Balfour, First Sea Lord Jackson, and the Third Sea Lord.⁸⁴ Further, it was agreed that the War Office opposition to RNAS long-range bombing was purely reactionary as the RFC did not in fact possess the means to conduct long-

⁷⁶ Vaughan-Lee, Director Air Services to the Chief of Staff, Henry Oliver, 17 February 1916, ADM 1/8449/39A, p. 2.

⁷⁷ Goulter, 'The Royal Naval Air Service', p. 59. See also, Joint War Air Committee, Extracts from Paper Air 4, dated 3 March 1916, AIR 1/270, #106 in Roskill, *Documents*, p. 310.

⁷⁸ Joint War Air Committee, Extracts from Paper Air 4, dated 3 March 1916, AIR 1/270, #106 in, Roskill, *Documents*, pp. 309-315.

⁷⁹ Ibid, pp. 309-315. See also, Minutes of the JWAC meeting, 6 March 1916, AIR 1/2319. Minute by Sir W. Graham Greene, dated 4 June 1916, ADM 1/8449, #128 in Roskill, *Documents*, p. 365. War Office Letter 79/8883 (M.O.1) of (?) 25 May 1916 to Admiralty... ADM 1/8449, #128 in Roskill, *Documents*, p. 364.

⁸⁰ Vaughan-Lee minute on RNAS Establishment, 15 March 1916, ADM 1/8449/39A.

⁸¹ Jones, *WIA*, vol. VI, p. 118.

⁸² Thetford, *British Naval Aircraft*, pp. 296-7.

⁸³ Emphasis in original. Joint War Air Committee, Extracts from Paper Air 4, dated 3 March 1916, AIR 1/270, #106 in Roskill, *Documents*, p. 310.

⁸⁴ Pulsipher, 'Aircraft and the Royal Navy', p. 323.

range bombing missions, contrary to Henderson's claims that the RFC was moving in that direction.⁸⁵

On 4 April Vaughan-Lee contacted CNS Rear-Admiral Oliver and explained his rationale for insisting on the offensive policy, arguing that the best possible way to mitigate the Zeppelin threat was through the bombing of the enemy's bases, significantly, the munitions factories in Germany. The DAS believed these bombing raids would have an important impact on enemy morale.⁸⁶ From the Navy's perspective there was every reason to start industrial bombing both as retaliation for the Zeppelin raids, but also as part of a broader program aimed at reducing Germany's capacity to continue the war. Oliver authorized Vaughan-Lee to push ahead with the project, working directly through the French, thus circumventing the War Office entirely.⁸⁷

But soon the Army re-asserted itself. Although Field Marshal Haig had already approved of the bombing effort in principle in May and June, the Army Council had second thoughts. The Council issued a statement on 25 May to the effect that the Navy should not be operating from Army demarcated regions. Vaughan-Lee, however, had the support of the JWAC and Field Marshal Haig even authored a supporting letter on 3 June, stating that 'the C-in-C of the British armies is not concerned' by RNAS operations conducted in the French sector.⁸⁸ Nevertheless, the Army Council persisted, authoring another criticism of the RNAS policy that June. DAS Vaughan-Lee was understandably concerned by the Army's complaints: 'It is the same story,' he wrote on 5 June 'the War Office want to stop our long distance bombing in order to get hold of our engines and machines and so to cover their own deficiencies,' a not unreasonable assessment of what would become a relentless inter-service quarrel.⁸⁹

Major-General Trenchard, the RFC field commander in France and Haig's right-hand airman,⁹⁰ now made a request through the Curzon Air Board for 60 additional machines that had been intended for No. 3 Wing. With preparations for the Somme campaign consuming resources and the Air Department caught operating behind BEF lines, the Admiralty agreed to hand over

⁸⁵ Memorandum of Meeting Held in Second Sea Lord's Room, Tuesday, 21 March 1916, ADM 1/8449/39A, p. 2.

⁸⁶ Vaughan-Lee to Henry Oliver, 4 April 1916, ADM 1/8449.

⁸⁷ Minute by Vice-Admiral Sir Henry Oliver, Chief of the War Staff, 5 April 1916, ADM 1/8449, #120 in Roskill, *Documents*, p. 344.

⁸⁸ Jones, *Origins of Strategic Bombing*, pp. 80-1, 97. See also, GHQ Directive, 3 June 1916, AIR 1/978/204/5/1139. History of No. 3 Wing, RNAS, undated, AIR 1/2107/207/42.

⁸⁹ Minute by Rear-Admiral C. L. Vaughan-Lee dated 5 June 1916, ADM 1/8449, #128 in Roskill, *Documents*, p. 365.

⁹⁰ Gary Sheffield, *The Chief: Douglas Haig and the British Army*, Kindle ebook (London: Aurum Press Ltd, 2011), p. 151.

the machines that otherwise would have gone to the No. 3 Wing.⁹¹ No. 3 Wing's machines were thus handed over to the RFC in dribbles through to September.⁹² This crippled the Wing and by the end of August only 22 machines had been delivered, with a further 47 by the new year.⁹³ The deficiency was somewhat remedied by the acquisition of Breguet bombers from France, but this was a distinct setback for No. 3 Wing. Despite the mixed signals from the Air Board, Army Council, BEF HQ, and RFC in the field, by the end of July the RNAS had advanced its long-range bombing program to the point where operations were now possible.

Bombing Commences, No. 3 Wing Successes in 1916-1917

Meanwhile, despite the jockeying for resources at the JWAC, the first elements of No. 3 Wing had been formed in February at Detling, where a core group of Sopwith Strutters was organised under Squadron Commander R. L. G. 'Reggie' Marix.⁹⁴ They were to target the factories at Essen and Dusseldorf,⁹⁵ however, the project was halted in May as the flight path to the targets would have violated the airspace neutrality of the Netherlands.⁹⁶ On 1 May Captain W. L. Elder was dispatched to Paris to inquire if the French authorities still desired the assistance of an RNAS force in their proposed joint industrial bombing project.⁹⁷ Meeting with approval, the project was revived and at the end of May orders went out to assemble a wing to cooperate with France's 4th Bombardment Group at Luxeuil, forward based at Ochey, where the target was industry located near Freiburg. A construction party of 125 men was dispatched to Luxeuil on 16 June.⁹⁸ It was intended to dispatch six Strutters a week, for ten weeks, until the requisite 60 machines had been assembled. That total, well short of the 100 machines ultimately planned, was never reached.

The force that the RNAS was in the process of assembling was designated No. 3 Wing, replacing Samson's Gallipoli wing as it had dispersed when the Dardanelles campaign closed

⁹¹ Letter from the Secretary of the Air Board AB 97/5 of 23 June 1916 to the Secretary of the Admiralty, AIR 1/650, #129 in Roskill, *Documents*, pp. 366-7. History of No. 3 Wing, RNAS, undated, AIR 1/2107/207/42.

⁹² Jones, 'Ashore, Afloat and Airborne', p. 42. Layman, *Naval Aviation*, p. 74.

⁹³ Layman, *Naval Aviation*, p. 74.

⁹⁴ History of No. 3 Wing, RNAS, undated, AIR 1/2107/207/42.

⁹⁵ Operation Record Book, No. 216 Squadron, RAF, Late No. 16 Squadron, RNAS, 1939, AIR 27/1332/1. Jones, *Origins of Strategic Bombing*, p. 80.

⁹⁶ Jones, *The Origins of Strategic Bombing*, p. 79.

⁹⁷ Wing Captain Elder, summary of No. 3 Wing history, 24 May 1917, AIR 1/2266, p. 2

⁹⁸ Ibid.

down in December 1915.⁹⁹ The strong No. 3 Wing team comprised Wing Captain William Elder, Wing Commander Richard Bell Davies, and Squadron Commander Reggie Marix, the latter based at Manston, near Ramsgate, and responsible for training the wing's squadrons (bombing training actually took place at Eastchurch).¹⁰⁰ Operational command was given to Bell Davies. The wing included a large number of Canadian pilots (44 of 74), notably including the future Western Front ace Raymond Collishaw.¹⁰¹

Captain Elder, who had previously replaced Captain F. R. Scarlett as the Inspecting Captain of Aircraft in November 1914, was now promoted to acting Wing Captain and placed in overall command of No. 3 Wing effective 14 June 1916.¹⁰² Elder's operational orders arrived on 27 July, instructing him how to arrange operations with the French, but also stipulating that 'as a general rule, the objectives should be of military value'.¹⁰³ The bombing of unfortified towns was not permitted as had been agreed at the Hague convention of 1907. To make certain the Army did not interfere Captain Elder was supplied with an advanced cypher known as 'J' for communications directly to the Secretary of the Admiralty or to Captain W. H. Kelly, the RN liaison in Paris.¹⁰⁴

The first operation was carried out on 30 July as a joint Franco-British effort, conducted against German benzene stores and barracks located at Mulheim.¹⁰⁵ Poor flying weather 'black fogs and mists' - pollution from the munitions works - that accumulated around the factories hampered detection of specific targets.¹⁰⁶ Only 520 lbs of bombs was dropped by the two RNAS Sopwith Strutters that managed to launch and fly the 190 km distance to Mulheim, where they were attacked by anti-aircraft fire.¹⁰⁷

The Mauser works at Oberndorf were now selected for the second mission, with the date of 3 September set. Operations were again delayed due to weather, with the result that action was

⁹⁹ Samson, *Fights and Flights*, pp. 286-8. Sturtivant and Page, *Royal Navy Aircraft Serials*, p. 433.

¹⁰⁰ Marix was disabled by a plane crash in October 1916, losing a leg. Davies, *Sailor in the Air*, pp. 145-6. Lewis, *A Few of the First*, p. 127. Roskill, *Documents*, p. 27. Lea, *Reggie, The Life of Air Vice Marshal R L G Marix*, pp. 58-9.

¹⁰¹ Gunn, *Raymond Collishaw and the Black Flight*, p. 47.

¹⁰² Elder, William Leslie, RNAS Record of Service, ADM 273/2, p. 44.

¹⁰³ W. Graham Greene to CO No. 3 Wing, 27 July 1916, AIR 1/115.

¹⁰⁴ Admiralty Letter M.06613 of 27 July 1916 to the Officer Commanding No. 3 Wing, RNAS, in France, ADM 1/8449, #132 in Roskill, *Documents*, p. 373.

¹⁰⁵ Gunn, *Raymond Collishaw and the Black Flight*, p. 46.

¹⁰⁶ Operations Record Book, No. 216 Squadron, RAF, late No. 16 Squadron, RNAS, 1939, AIR 27/1332.

¹⁰⁷ Operations from Luxeuil and Ochey – details of air raids over enemy territory, July 1916, AIR 1/111/15/39/1

not resumed until 12 October. On this date, 21 RNAS aircraft (15 bombers and 6 fighters), dropped 3,867 lbs of bombs on the Mauser factory, in support of the 25 French bombers and nine fighters that also flew the 223 miles to raid Oberndorf.¹⁰⁸ Three RNAS aircraft were forced down and their pilots captured, although the Allies claimed six German planes destroyed during the raid.¹⁰⁹

This raid against the Oberndorf works appeared to be a great success and the Admiralty was keen to take credit, observing that the French report on the raid had not specified that the British aircraft in question were naval: an oversight Captain Elder was explicitly instructed to remedy in future.¹¹⁰ It is significant to observe that the light French built Breguet pusher bombers, although vulnerable at an altitude of 9,000 ft, were still able to penetrate to the target and drop their bombs, returning successfully.¹¹¹

Captain Elder reported on 25 October that the Germans had constructed four new aerodromes and were enhancing their air defences around the industrial centres. In fact, a German Home Air Defence Command had been created in October,¹¹² reflecting similar developments that had previously occurred in Britain during 1915-1916. Germany's home defence arrangements were still limited in early 1917, indicating that the Allies had struck a significant blow against which the Germans were not prepared to defend. Expanded German Zeppelin and bomber retaliation against Britain soon followed (see Chapter Six).

After rebasing at Nancy and then to Ochey, on 23 October Red Squadron of No. 3 Wing, in conjunction with the French, bombed the steel works at Hagendingen with 3,000 lbs of bombs, disabling three of the five furnaces.¹¹³ The Thyssen Works at Hagendingen were also bombed on 23 October and, as the Wing picked up momentum, continued by bombing the Volklingen steel works on 10 November.¹¹⁴

On 26 October the Admiralty proposed to the Air Board that it intended to keep 200 machines in France, at DAS Vaughan-Lee's request, while also seeking to acquire 2,000 engines

¹⁰⁸ Gunn, *Raymond Collishaw and the Black Flight*, p. 50. Jones, *WIA*, vol. II, p. 453. Operations from Luxeuil and Ochey... AIR 1/111/15/39/1.

¹⁰⁹ Operations from Luxeuil and Ochey, AIR 1/111/15/39/1.

¹¹⁰ Secretary of Admiralty to CO RNAS No. 3 Wing, 19 October 1916, AIR 1/115.

¹¹¹ Wing Commander R. B. Davies, No. 3 Wing Oberndorf raid pilot reports, 12 October 1916, AIR 1/111.

¹¹² Jones, *Origins of Strategic Bombing*, p. 118. See also, Proposals for bombing of blast furnaces in France, Belgium and Alsace-Lorraine, AIR 2/123.

¹¹³ Roger Gunn, *Raymond Collishaw and the Black Flight*, pp. 59-60.

¹¹⁴ Jones, *WIA*, vol. II, p. 453.

for the purpose of long-range bombing.¹¹⁵ These were the kinds of numbers that were guaranteed to raise the concerns of the RFC. Vaughan-Lee continued to hold his ground, re-asserting his March position at a meeting of the War Committee on 9 November.¹¹⁶ Balfour and Air Board president Lord Curzon meanwhile battled for control of the RNAS, until Curzon was replaced by Lord Cowdray and First Lord Balfour by Sir Edward Carson at the beginning of 1917. The result was that the Ministry of Munitions and then the Air Board received control of procurement, actually Curzon's goal all along.¹¹⁷ Jellicoe and Carson were meanwhile distracted by the pressing requirements of ASW, requiring specialized aircraft, equipment, and organizational reform, and thus were busy re-arranging the RNAS into regional groups when Colonel Jan Smuts issued his reports in the fall of 1917, effectively guaranteeing the creation of the Air Ministry and RAF.

These developments were a year in the future for No. 3 Wing in 1916. The weather again turned poor after October and remained so for many months, well into April and the spring of 1917. The 1916-17 winter was generally regarded as extraordinarily harsh, curtailing the effectiveness of No. 3 Wing's bombing effort.¹¹⁸ Wing Captain Elder reported that the oil in the Clerget engines of the Strutters froze in the unheated sheds at Ochey.¹¹⁹

A positive sign was the arrival of the night-bombing Handley Page O/100 aircraft over the winter of 1916/1917. The first aircraft were added to the wing in November 1916, although the first operations with the new aircraft did not take place until the night of 16/17 March 1917, when a single such aircraft was utilized on a raid.¹²⁰ Although numbers were restricted, each of these two-engine bombers could carry up to 12, 100 lb, bombs, thus each Handley Page bomber had the lifting capacity of three of the DH4 day-bombers that were likewise beginning to arrive at this time.¹²¹

The War Office, RFC and Army Council increased their opposition to the RNAS long-range bombing efforts. Trenchard and Henderson had already pressured Haig to withdraw his support, which the Field Marshal did on 1 November in a critical letter that denounced the

¹¹⁵ Memorandum for the War Committee: Long-Range Bombing Operations by Aircraft, 9 November 1916, CAB 42/26/1, p. 1. Same as #144 in Roskill, *Documents*, pp. 418-22.

¹¹⁶ *Ibid*, p. 2

¹¹⁷ Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 45.

¹¹⁸ Jones, *Origins of Strategic Bombing*, p. 105.

¹¹⁹ Wing Captain Elder to the Secretary of the Admiralty, 24 May 1917, AIR 1/2266, p. 4.

¹²⁰ Jones, *Origins of Strategic Bombing*, p. 122.

¹²¹ *Ibid*, pp. 122-5.

apparent diversion of long-range bombing.¹²² Lt. General Henderson, when debate was sparked by the first report of the Air Board in November 1916, was insistent that the government take a position on the definite policy of the two air services.¹²³ The debate was territorial and the Admiralty was clearly at a disadvantage as the key players on the Air Board, Army Council, and at the Ministry of Munitions had already set their minds towards the creation of a unified Air Ministry. Henderson, Curzon, and Montagu, amongst others, had already decided, as early as the beginning of 1916, that they favoured the development of a third, Imperial, Air Service and were thus moving in that direction while the Admiralty, understandingly, dragged its heels.

Rear-Admiral Tudor, the Third Sea Lord and responsible for the Royal Navy's material, pointed out that the RNAS was rather different from the RFC in that the RNAS was tightly integrated into the Navy and if 'the Supply of the Naval aircraft was to be transferred it would mean uprooting the whole organisation.'¹²⁴ According to Tudor, it was primarily the duty of the RNAS to focus on interfering with the efficiency of the German Fleet. The 'first object of [the RNAS] should therefore be to destroy in their sheds the Zeppelins which are the eyes of the German fleet, and the second to attack the factories which provide for the replacement of the guns, &c. of that fleet, with a view either to inflict actual damage upon them, or to reduce their output by compelling the extinction of lights, &c.'¹²⁵ Rear-Admiral Tudor was thus following the lead of Balfour, and Churchill before him by advocating a naval driven bombing campaign.

The Admiralty clearly conceived of the RNAS long-range bombing program as a component of its broader naval policy, a priority, whereas the Air Board and Ministry of Munitions perceived only intransience towards their own airpower policy. DGMA Henderson could only perceive resources and in his mind's eye those that were going to the RNAS would be better directed towards the Army.

The battle over No. 3 Wing had, however, been lost by March 1917. That month Field Marshal Haig, again supported by RFC commander Trenchard, framed the Navy's No. 3 Wing bombing program as an impingement on the proper authority of the C-in-C BEF and, on 7 March, six planes, 19 pilots, and 100 ratings were transferred to Dunkirk. The writing was on the

¹²² Ibid, p. 93.

¹²³ Cooper, 'The British Experience of Strategic Bombing', p. 53.

¹²⁴ Rear-Admiral Tudor's statement, Minutes of the One Hundred and Forty-First meeting of the War Committee, 28 November 1916, CAB 42/26/1, p. 9.

¹²⁵ 'Memorandum for the War Committee: Long-Range Bombing Operations by Aircraft,' 9 November 1916, CAB 42/26/1, #144 in Roskill, *Documents*, p. 418.

wall and on 25 March the Luxeuil bombing wing was at last ordered to disband. A final operation was proposed but then postponed on 1 April so that a retaliatory raid against Freiburg could be flown.¹²⁶ Before this mission could take place, however, a single Handley Page managed to raid the railways at Arnaville, dropping 12 100 lb bombs with good effect.¹²⁷ This raid was followed by two additional raids both flown by single Handley Page bombers, both on 14 April, the same day as the Freiburg raid. One plane bombed the Hagendingen blast furnaces, while the other bombed the aerodrome at Chambley.¹²⁸

On 14 April Freiburg's city centre was bombed in a strictly reprisal raid for the torpedoing of the hospital ships *Glenart Castle*, *Asturias* and *Gloucester Castle* in March and April, although the cycle of retaliation was followed by the sinking of *Lanfranc* and *Donegal* both the evening of 17 April.¹²⁹ The losses of these hospital ships by submarine attack convinced the Allies to abandon designating their ships with the Red Cross paint and lighting.¹³⁰ The retaliatory raid was carried out by 25 British and 15 French aircraft.¹³¹ Thus when the No. 3 Wing was at last disbanded it had conducted both industrial long-range bombing and also strictly morale targeting reprisal attacks. Wing Captain Elder could not help but remind the Admiralty that the choice of timing meant closing the wing exactly when the weather was likely to improve, while the immense effort of assembling the pilots, machines, mechanics and staff would be lost.¹³² The choice of a retaliatory raid as the final mission seemed especially bizarre when the wing was about to be disbanded: what if more retaliatory missions were required in the future?

On 10 January 1917 Commodore Paine had been promoted to Fifth Sea Lord, replacing DAS Vaughan-Lee. Paine's primary mission was to oversee the expansion of the RNAS into a dedicated A/S and fleet force, given that he now reported directly to Jellicoe, who would not equivocate on the issue of air support for the fleet let alone the need to provide patrol aircraft for ASW.¹³³ Paine, who had commanded the CFS before the war, had every reason to jettison the long-range bombing mission in France, especially since the Handley Page bombers could be re-

¹²⁶ Jones, *WIA*, vol. VI, p. 121fn.

¹²⁷ Commanding Officer Handley Page Squadron to Wing Captain Elder, raid night of 5-6 April 1917, AIR 1/638.

¹²⁸ Wing Captain Elder, Appendix II, Summary of Raids Carried out by No. 3 Wing, RNAS, between 30th July and 14th April 1917, AIR 1/2266.

¹²⁹ Gibson and Prendergast, *The German Submarine War*, pp. 164-5.

¹³⁰ Jones, *Origins of Strategic Bombing*, p. 123.

¹³¹ *Ibid.*, p. 122.

¹³² Wing Captain Elder to the Secretary of the Admiralty, 24 May 1917, AIR 1/2266.

¹³³ Thirty Second Meeting of the Air Board, 3 January 1917, AIR 6/4.

tasked for bombing Bruges or flying A/S patrols. When asked by Commodore Paine if Field Marshal Haig could provide evidence to support the claims regarding the impact of bombing on steel production, Haig considered it ‘highly improbable’ that there had been much of an impact.¹³⁴

Assessing the Impact of No. 3 Wing

Between October 1916 and April 1917 No. 3 Wing carried out 18 long-range raids, of which 13 were raids against industrial targets, dropping an average of 2,500 lbs of bombs per raid (38,617 lbs total).¹³⁵ The direct impact on production was small. During November and December 1916, for example, it was assessed that production at the targeted blast furnaces declined by only about 4%, possibly because some of the Swiss labourers returned home as a result of the bombing.¹³⁶ It is important to recognize that despite the minimal impact on production figures the raids had a disproportionate effect so far as they forced the German High Command to transfer resources to the defensive. H. A. Jones wrote that the bombing operations ‘...compelled the Germans to divert aeroplanes, labour, and material...’ towards home defence rather than the front lines.¹³⁷ This is always a questionable justification given the logic of determining what was *not* utilized at the front, and George Williams has argued that the German squadron records, which portray the German air defence reaction as limited and primarily aimed against the French, as having ‘demolished’ this argument.¹³⁸ Williams concluded that ‘Admiralty bombs never posed a threat to German productivity along the Saar.’¹³⁹ That said, No. 3 Wing’s mission was terminated at exactly the point when its operational strength was reaching significant levels.

Generally speaking, the No. 3 Wing experience was a disappointment. Squadron Commander Richard Bell Davies reported that both he and Wing Captain Elder had been demoralized by the work that they felt was taking them away from their proper role with the fleet, to which they were soon to return.¹⁴⁰ This may have been sour grapes on Bell Davies part,

¹³⁴ Jones, *WIA*, vol. VI, p. 122.

¹³⁵ Notes on report of bombing operations of No. 3 Wing RNAS in France during winter 1916/1917, AIR 1/2266. Cooper, ‘The British Experience of Strategic Bombing’, p. 52. Wing Captain Elder history and operations of No. 3 Wing, 24 May 1917, AIR 1/2266, p. 5.

¹³⁶ Cooper ‘The British Experience of Strategic Bombing’, p. 52. Davies, *Sailor in the Air*, p. 157.

¹³⁷ *Ibid*, p. 122.

¹³⁸ Williams, *Biplanes and Bombsights*, ebook, chapter 1, loc. 696.

¹³⁹ *Ibid*, loc. 659.

¹⁴⁰ Davies, *Sailor in the Air*, p. 158.

whereas Captain Elder ‘greatly regretted’ having to close down the wing.¹⁴¹ It is worth pointing out that the close cooperation between the Allies encouraged the French to develop their own heavy ‘Essen bomber’ as a replacement for the Handley Page bombers that were returned to England.¹⁴² The disbandment of the wing meant that 60 skilled officers, a trained staff, and 1,200 men were dispersed - not only halting operations but also making it impossible to restart them on short notice.¹⁴³ In May the remaining aircraft were reformed as No. 10 (Naval) Squadron for service on the Western Front.¹⁴⁴

RFC Director-General Henderson and Field Marshal Haig have been credited with shared responsibility for pushing through the dismemberment of the RNAS long-range bombing wing.¹⁴⁵ Indeed, the RFC was quick to assume control and it was in October, not long after the dismantling of No. 3 Wing, that Major-General Trenchard was ordered to establish the 41st Wing RFC, a long-range bombing group, at Nancy.¹⁴⁶ It was now that the War Office, despite its earlier criticisms, seemed to appreciate the utility of targeting the enemy’s blast furnaces and munitions factories.¹⁴⁷ By January 1918 the Air Policy Committee, responsible for setting up Trenchard’s long-range wing in October 1917, advocated a systematic bombing campaign in which individual towns would be bombed with the goal that the ‘morale of the workmen is so shaken that output is seriously interfered with.’¹⁴⁸

The 41st Wing and RNAS No. 16 Squadron

The disbanding of No. 3 Wing coincided with the beginning of Germany’s Gotha raids. At the 26 June 1917 War Cabinet meeting the case for resuming long-range bombing, specifically with the intention of retaliating for bombing against Britain, was discussed. Field Marshal Haig, Lieutenant General Henderson, and Major-General Trenchard were all consulted. Trenchard not surprisingly expressed skepticism and Haig professed that he could not recommend it but, if the Cabinet decided to move ahead, the Field Marshal believed the force should fall under his

¹⁴¹ Wing Captain Elder to Secretary of the Admiralty, 24 May 1917, AIR 1/2266.

¹⁴² Kennett, *The First Air War*, p. 50.

¹⁴³ Wing Captain Elder, 24 May 1917, AIR 1/115.

¹⁴⁴ Abbatiello, *Anti-Submarine Warfare*, p. 64. Jones, *WIA*, vol. VI, p. 121.

¹⁴⁵ Pulsipher, ‘Aircraft and the Royal Navy’, p. 321.

¹⁴⁶ Jones, *WIA*, vol. VI, p. 123.

¹⁴⁷ ‘Extracts from Minutes of the Thirtieth Meeting of the Air Board held on 11 December 1916. A.B. 30’ ADM 1/8449, #147 in Roskill, *Documents*, p. 431.

¹⁴⁸ Reports and memorandum drawn up for consideration by Strategic Council, 17 January 1918, AIR 1/463/15/312/137. Cooper, ‘The British Experience of Strategic Bombing’, p. 55.

control.¹⁴⁹ The critical letter, authored by Lt. General Henderson, Commodore Paine, Major-General Trenchard, and endorsed by Field Marshal Haig, suggested that only Mannheim was worth bombing, and that only two squadrons of DH4s could be spared for such an operation. 30 aircraft was suggested as the force minimum, but ultimately the sub-committee report recommended delaying operations until October 1917.¹⁵⁰ By that time however the situation the weather restrictions encountered by No. 3 Wing the previous year were liable to be repeated. Furthermore, the War Cabinet was informed on 5 September that Germany's Gotha squadrons' base, responsible for the summer attacks against England, had been located and was to be counter-bombed by aircraft attached to Field Marshal Haig's command.¹⁵¹ The question of how to 'carry the aerial war into Germany, not merely on the ground of reprisal' was raised,¹⁵² and speed was of the essence. Unfortunately, no British long-range bombing squadron was available. How different the situation would have been if No. 3 Wing had been retained.

Eventually Trenchard established the RFC's 41st Wing and placed Lieutenant Colonel C. L. N. Newall, the future CAS, in operational command.¹⁵³ The RFC now requested RNAS support for its usurpation of the long-range bombing mission.¹⁵⁴ The Admiralty Air Department's contribution was No. 16 squadron, scratched together from several sources: four Handley Page O/400s originating from Redcar, Hendon, and Coudekerque, were matched by other HP O/100s and the squadron was built up to ten aircraft, based at Manston, Kent.¹⁵⁵ The squadron's machinists and ratings had to be assembled on short notice.¹⁵⁶ The new squadron was initially designated the 'A' flight of RNAS No. 7 squadron, and by mid-October 1917 was deployed to Ochey, France.¹⁵⁷ Squadron Commander K. S. Savory was in command, a veteran Handley Page officer who had flown bombing missions against Constantinople and against Turkish shipping.

¹⁴⁹ Appendix, Cabinet Committee War Policy on Long-Distance Bombing Operations, War Cabinet 169, 26 June 1917, CAB 23/3/17, p. 9.

¹⁵⁰ Appendix I & II. Report on Long-Distance Bombing Operations War Cabinet 169, 20 & 22 June 1917, CAB 23/3/17, p. 9.

¹⁵¹ War Cabinet Minutes 228, 5 September 1917, CAB 23/4/2, p. 2.

¹⁵² Ibid.

¹⁵³ Jones, *WIA*, vol. VI, pp. 122-3.

¹⁵⁴ Operation Record Book, No. 216 Squadron, RAF, Late No. 16 Squadron, RNAS, 1939, AIR 27/1332/1, p. 3.

¹⁵⁵ Peter Lewis, *Squadron Histories: RFC, RNAS, and RAF, 1912-1959* (London: Putnam, 1959), p. 75.

¹⁵⁶ Wing Captain Lambe to Commodore Dunkirk and Vice-Admiral Dover Patrol, 31 October 1917, AIR 1/640.

¹⁵⁷ Sturtivant and Page, *Royal Navy Aircraft Serials*, p. 435. Operation Record Book, No. 216 Squadron, RAF, Late No. 16 Squadron, RNAS, 1939, AIR 27/1332/1.

The inaugural raid against the Burbach works at Saarbrücken was carried out on 24 October.¹⁵⁸ No. 16 Squadron conducted raids against railway junctions, factories and military barracks from its base at Ochey and it wasn't long before Germany became aware of the operation. Ochey was subsequently counter-raided on 15 November when the enemy dropped a dozen bombs on the aerodrome.¹⁵⁹ By the beginning of 1918 No. 16 was one of only two remaining RNAS squadrons operating with the RFC, the other being No. 8 Squadron.¹⁶⁰ Squadron Commander Savory was soon replaced by Squadron Commander H. A. Buss,¹⁶¹ who remained with No. 16 Squadron until replaced himself by Major W. R. Read on 1 September 1918.

The gap created by the dissolution of No. 3 Wing under Wing Captain Elder in May 1917 allowed the RFC to assume control in the form of the reassembled 41st Wing, carrying out the same essential mission. Under Trenchard's leadership, however, the wing was focused on Haig's objectives: targeting tactical and operational locations as much as possible. In Haig's calculus, also endorsed by the Chief of the Imperial General Staff (CIGS) Field Marshal Sir William Robertson, the pinpricks produced by the 41st Wing were simply not worth the effort while the Western Front was ever short on additional material.¹⁶²

Churchill, the Minister of Munitions at this time, and Sir William Weir, future Air Minister, believed that the completion of a re-armament and training cycle over the winter of 1917-1918 would permit a windfall of machines in the second half of 1918, making larger scale operations possible.¹⁶³ Rear-Admiral Kerr was one amongst the Royal Navy officers who had believed, back in October 1917, that a dramatic expansion of the air war was critical. Towards this end he wrote that 'we must start at once with our preparations to lay their factories flat, and to destroy their aerodromes. This will entail the building of 2,000 big bombing machines as a minimum'.¹⁶⁴ Kerr found himself facing First Sea Lord Jellicoe's ire for this act, but soon

¹⁵⁸ Operation Record Book, No. 216 Squadron, AIR 27/1332/1.

¹⁵⁹ Ibid, p. 5

¹⁶⁰ Appendix XXVIII, List of Naval Squadrons which served with the RFC and RAF on the Western Front 1914-18, in Jones, *WIA*, Appendices, pp. 142-4. Jones, *WIA*, vol. VI, pp. 122-3.

¹⁶¹ Harding and Chapman, eds. *A History of Number 16 Squadron*, p. 15.

¹⁶² Air Raids and Bombing of Germany, Minutes of a Meeting of the War Cabinet, 9 October 1917, CAB 23/4/21 pp. 5-6.

¹⁶³ Ibid, p. 6.

¹⁶⁴ Memorandum entitled 'Air Policy', 11 October 1917, addressed to Lord Cowdray, President of the Air Board, by Rear-Admiral Mark E. F. Kerr. Cabinet G.T. 2284. Milner Papers, Bodleian, Box 122, Folio 84-5, #198 Roskill, *Documents*, pp. 562-4.

escaped to the Air Ministry where he was made Deputy Chief of Staff.¹⁶⁵ Kerr, like Murray Sueter, was one of the independent 'Fifth Column' within Cabinet and amongst the Navy who sympathized with Churchill and Henderson's original vision of a unified air force.¹⁶⁶

Nor were Kerr and Sueter alone. Longtime bombing advocate A. V. Vyvyan, who had authored many of DAS Vaughan-Lee's statements while serving as the head of the Naval Assistant's office for the Director, was a key RNAS promoter of long-range bombing who essentially endorsed the Admiralty's policy of night bombing by heavy aircraft. In 1918 Vyvyan was made Assistant Chief of the Air Staff and, alongside Deputy Chief Mark Kerr, was in a position to directly impact CAS Major-General Frederick Sykes, himself a convert to the Independent Force mission, desirous of what his biographer Eric Ash described as, 'the continuous long-range bombing of German industries.'¹⁶⁷

The influence of Captain Vyvyan, the architect of Vaughan-Lee's 1916 long-range bombing agenda, was ongoing. At the Air Board meeting on 30 July 1917 it was decided to authorize an order of 100 Handley Page machines, primarily for night bombing operations, in addition to three experimental super-heavy aircraft, the Handley Page type V.1500.¹⁶⁸ Trenchard and Henderson, still focused on supporting the RFC with light and medium bombers at the expense of heavier aircraft, opposed this decision. Vyvyan convinced the skeptical RFC commanders with data presented at the 10 August Board meeting that demonstrated that the Handley Page suffered a lower casualty rate than the smaller DH4 aircraft the Army was using.¹⁶⁹ Indeed by the end of the war No. 216 and 215 squadrons, the two formerly Naval squadrons committed to the Independent Force, had sustained only an astonishing four injuries between them, with 39 pilots missing (presumed shot-down or captured). This compared well with No. 99 squadron, for example, with six killed and 16 wounded, 42 missing, or with No. 55 squadron with 13 killed, 11 wounded, 36 missing.¹⁷⁰ Wastage between the two Naval squadrons

¹⁶⁵ Mark Kerr, *Land Sea and Air*, p. 293. Service record of Mark Edward Frederic Kerr, ADM 196/42, sheet 126, p. 253.

¹⁶⁶ Correspondence between Lord Rothermere, President of the Air Board, and Sir Eric Geddes, First Lord, November-December 1917, ADM 116/1602, #252 in Roskill, *Documents*, p. 669. Correspondence between Sir Eric Geddes, 1st Lord, and Sir William Weir, Secretary of State for the Royal Air Force, May 1918, ADM 116/1807, #210 in Roskill, *Documents*, pp. 592-3.

¹⁶⁷ Ash, *Sir Frederick Sykes*, p. 155.

¹⁶⁸ Jones, *WIA*, vol. VI, p. 166.

¹⁶⁹ *Ibid.*, p. 167. Statistics of Work of Squadrons of the Independent Force, Including Wastage, June-November 1918, Appendix XII, in Jones, *WIA*, Appendices, pp. 40-1.

¹⁷⁰ *Ibid.*, pp. 40-1.

in terms of aircraft amounted to only 13 Handley Page bombers. A greater testament to Churchill and Sueter's vision from 1915 - excepting only the tank - would be difficult to find.

The Independent Air Force

CAS Frederick Sykes, following Trenchard's resignation in April 1918, now laid out the case for the 'dislocation of Germany's industrial effort by long-range bombing', a task Sykes considered vital to the total war effort.¹⁷¹ To fulfill Sykes' vision, the IAF of the RAF, also known as the VIII Brigade, was created on 6 June 1918. The IAF was the logical next step towards fulfilling the 41st Wing's mission. The expanded force was composed of two wings divided between night and day bombing squadrons. The 41st Wing assumed the duties of the day bombing squadron, while No. 216, formally No. 16 RNAS, joined No. 100 Squadron to comprise the 83rd Wing, based at Bainville-sur-Madon, for night-bombing operations.¹⁷² When Trenchard returned to the field in June 1918 the IAF comprised three daylight bombing squadrons and two night bombing squadrons. The Force soon expanded to nine squadrons and on 4 July RNAS No. 215 Squadron, under the command of Major J. F. Jones and flying additional Handley Page O/400 bombers, was added, arriving alongside No. 216 Squadron (now stationed at Autreville and under the field command of Major-General Thomson) on 19 August.¹⁷³

Trenchard had been out in the cold since his split with Air Minister Rothermere in March 1918, an upheaval comparable to the May Crisis that brought down Fisher and Churchill in 1915. Trenchard had no choice but to take the job being offered with the IAF.¹⁷⁴ CAS Sykes, one of Trenchard's strongest critics, considered his appointment a purely temporary affair.¹⁷⁵ Ironically, Sykes found himself in the same position as Vaughan-Lee in 1916, wanting to ensure that his long-range bombing force was not interfered with by the C-in-C BEF.¹⁷⁶

Sykes was lucky that he could count on the support of his senior minister, Air Minister Lord Weir, in this case. Like Admiral Kerr, Weir believed that the best way to counter

¹⁷¹ Sykes minute to David Lloyd George, 1 June 1918, in the *Air Power Review*, Special Edition, Spring 1913, p. 228.

¹⁷² Jones, *WIA*, vol. VI, p. 135.

¹⁷³ Appreciation of British Naval Effort during the War.- Role of the R. N. A. S., 16 January 1919, ADM 1/8549/13, p. 11. Statistics of Work of Squadrons of the Independent Force, Including Wastage, June-November 1918, Appendix XII, in Jones, *WIA*, Appendices, pp. 40-1 & Appendix XV, State of Independent Force, Royal Air Force, p. 87. See also Sturtivant and Page, *Royal Navy Aircraft Serials*, p. 435.

¹⁷⁴ Cooper, *Birth of Independent Air Power*, pp. 128-9.

¹⁷⁵ Ash, *Sir Frederick Sykes*, p. 157.

¹⁷⁶ *Ibid*, p. 159.

Germany's offensive bombing program was with a program of their own.¹⁷⁷ Weir and Sykes got a further taste of the bitter pill the Army Council had foisted upon the RNAS in May 1917 when they encountered opposition from the French regarding control of the IAF, which they believed should be incorporated in an Inter-Allied Force under Supreme Commander Foch's authority.¹⁷⁸ Field Marshal Haig, when faced with the possibility of either having Trenchard at the helm or losing the force to the French altogether, now gave his full support to Trenchard's IAF.¹⁷⁹

Like the Admiralty in 1916, Sykes and Weir simply ignored objections and carried on as though nothing had changed. It is difficult to avoid comparisons with the No. 3 Wing two years prior. Weir, like the Air Ministry in general, believed more in the morale impact of bombing rather than in its potential for industrial destruction and thus informed Trenchard that, according to Ash 'he did not care if the bombers missed their industrial targets and hoped that the bombers would set off large fires in German villages.'¹⁸⁰ Sykes preferred to focus on industrial bombing proper, but was willing to defer to the War Cabinet's ruling on reprisal and morale bombing. With his mission thus liberally, and vaguely, defined Trenchard went to work.

Trenchard now gave lip-service to industrial bombing claiming that he intended '[to] attack as many of the large industrial centres as it was possible to reach with the machines at my disposal',¹⁸¹ but quickly reverted to his old tactics of supporting the Army by bomber targets in their interest, namely aerodromes, railways, and bases as he had done in the summer of 1916.¹⁸² Trenchard continued to believe that a general air struggle leading to aerial dominance had to precede any long-range bombing operation.¹⁸³ This was a position strikingly similar to the belief held by GHQ that the 'wearing-out' battle was to precede the breakthrough.¹⁸⁴

Communications, railroad depots and junctions specifically, were a particular favourite of Trenchard and it was these centres that received the greatest attention under his leadership. Railway junctions were bombed at Metz (183 bomb hits), Thionville (120), Trevers (14), Ehrange (12), Saarbrücken (61), Coblenz (7), and Cologne (no hits), along with several

¹⁷⁷ Ibid, pp. 159-60.

¹⁷⁸ Ibid, p. 161.

¹⁷⁹ Ibid, p. 234.

¹⁸⁰ Ibid, p. 166.

¹⁸¹ Jones, *WIA*, vol. VI, p. 136.

¹⁸² Ash, *Sir Frederick Sykes*, p. 167.

¹⁸³ Jones, *WIA*, vol. VI, pp. 136-7. Jones, *Origins of Strategic Bombing*, p. 93.

¹⁸⁴ Sheffield, *Forgotten Victory*, Chapter 7, loc. 3429.

others.¹⁸⁵ Trenchard focused on Germany's exposed rolling stock, bombing locomotive sheds and workshops incessantly. Industrial targets were indeed bombed, such as the iron ore basins in Lorraine, the coal basins in the Saar Valley, the chemical and poison gas works at Ludwigshafen, but generally as secondary objectives.¹⁸⁶ Due to weather, engine failures, or enemy action, the raiders rarely arrived over the target with their entire force. Furthermore, targets were often bombed by mistake or as targets of opportunity, following Trenchard's guidance to focus on rail-lines, aerodromes, and other military targets.¹⁸⁷ Assessing his limited strength in preparation for the Hundred Days campaign, Trenchard returned to his old tactics, spreading the Force's squadrons over many targets. Trenchard continued to prioritize the bombing of enemy aerodromes and railways centers, with industrial targets a distinctly tertiary objective.¹⁸⁸

Trenchard's explanation for his own reversal of policy hinged on his conception of air power, describing to Lord Weir in early 1919 how '...in the past I had referred to the necessity for equipping the [BEF] on the Western Front with sufficient aircraft to hold and beat the German aerial forces on the Western Front; that the bombing of Germany was a luxury till this had been accomplished, but that, once accomplished, it became a necessity.'¹⁸⁹ Trenchard's explanation in this regard is in fitting with his close relationship with Haig, who likewise believed in the phased battle model. As Cooper put it, the military air policy '...on the Western Front was a microcosm of the strategy employed by Haig against Germany's commanding position in northeast France.'¹⁹⁰ While breakthrough on the Western Front remained unlikely, a small force operating in an area away from the front might have a disproportionate impact, such as could have been the case with No. 3 Wing. In short, Trenchard's tactics were focused on making an impact on the ground war.¹⁹¹

The 41st Wing and IAF, over their year-long campaign between October 1917 and November 1918, dropped 665 tons of bombs, the equivalent of 947 sorties by Handley Page

¹⁸⁵ Railways, Report of the Effects and Results of the Bombing of Germany By the 8th. Brigade and Independent Force, Royal Air Force, JSCSC, p. 7.

¹⁸⁶ Ibid, pp. 1-2.

¹⁸⁷ Statistics of Work of Squadrons of the Independent Force, Including Wastage, June-November 1918, Appendix XII, in Jones, *WIA*, Appendices, pp. 40-1.

¹⁸⁸ Major General Trenchard to Lord Weir, Air Minister, 1 January 1919, in the *Air Power Review, Special Edition*, Spring 2013, p. 236.

¹⁸⁹ Ibid, pp. 234-5.

¹⁹⁰ Cooper, *Birth of Independent Air Power*, p. 76.

¹⁹¹ See for example, Pugh, 'Conceptual Origins of the Control of the Air,' pp. 174-5. Russell Miller, *Trenchard: Father of the Royal Air Force*, kindle ebook (London: Weidenfeld & Nicolson, 2016), Chapter 10, loc. 2618.

bombers.¹⁹² 543 tons were dropped by Trenchard's command alone between June - November 1918, indicating the limited scale of the 41st Wing's efforts over the winter of 1917.¹⁹³ No. 216 Squadron dropped 176.5 tons, or 27% of the grand total, primarily against railroads and enemy aerodromes.¹⁹⁴ Indeed, a total of 220.25 tons were dropped specifically on aerodromes - representative of Trenchard's prioritization.¹⁹⁵

One post-war assessment indicated that the IAF, in the final eight months of the war, carried out at least 150 raids against aerodromes, primarily night raids against Boulay, Morhange, and Buhl, with an average of one and a half tons dropped per raid.¹⁹⁶ Of the 508 raids conducted by the 41st Wing and the IAF only 172 were actually flown against targets in Germany, initially the result of the great range required, however, longer range Handley Page and DH9 bombers were introduced in 1918.¹⁹⁷ According to post-war statistics reproduced in the official history, No. 216 and No. 215 squadrons, while operating with the 41st Wing and IAF, carried out a total of 70 raids of which only 28 were successfully conducted against primarily industrial targets (targets that were not specifically railways, barracks, or aerodromes).

When industrial centres were specifically targeted by the naval squadrons, such as Saarbrücken Burbach steel works or the chemical factories at Mannheim, the attacks themselves were usually divided between multiple individual targets, most frequently, railway junctions, barracks and aerodromes. Railway junctions, such as the Metz-Sablon junction, were specifically targeted and bombed 36 times by the two naval squadrons. Another six raids were primarily carried out against enemy bases, barracks and docks. Difficulty in assembling the bombing formations, weather interference, and engine failures would often prevent the bombers from reaching their targets with the result that the nearest target of opportunity, invariably railway junctions, were the most straightforward targets of attack. The figures are significant as they demonstrate that the former RNAS squadrons, with the longest experience in night bombing with Handley Page aircraft and with the No. 3 Wing experience behind them, were committed

¹⁹² Cooper, 'The British Experience of Strategic Bombing', p. 49.

¹⁹³ Statistics of Work of Squadrons of the Independent Force, Including Wastage, June-November 1918, Appendix XII, in Jones, *WIA*, Appendices, p. 40.

¹⁹⁴ Lewis, *Squadron Histories*, p. 75.

¹⁹⁵ Major General Trenchard to Lord Weir, Air Minister, 1 January 1919, in *Air Power Review*, Special Edition, Spring 2013, p. 237.

¹⁹⁶ Report on the Effects and Results of the Bombing of Germany by 8th Brigade and Independent Force, Royal Air Force: (D) Aerodromes, JSCSC, p. 31.

¹⁹⁷ Ibid.

primarily against the enemy's communications, with industrial bombing far from the primary focus.

To conclude, Brigadier General Trenchard perceived the IAF primarily as an instrument of operational destruction, prioritizing bombing missions against the enemy's bases and communications. This was despite agreement at the Air Ministry, and indeed in the Cabinet, that industrial targets proper should be focused on. Trenchard refused to change his methods. There simply was no systematic campaign against enemy industry. Indeed industrial targets, better defended and at greater range than the operational targets, were bombed on fewer occasions than railway junctions and aerodromes. Under Trenchard the IAF resembled the RNAS Dunkirk group less than the specifically industrial focused No. 3 Wing, whose targets were strictly in terms of steel works, blast furnaces and munitions factories.¹⁹⁸ It must have been with some sense of bittersweet vindication that Foreign Secretary Balfour, in October 1918, urged a transition to specifically focused attacks against only five German cities.¹⁹⁹ Trenchard shot back by telegraphing to Foch that the entire IAF should be transferred to Haig's command, the final indication that the leopard had not changed its spots.

Conclusion

From the outset of the war the RNAS long-range bombing mission was focused on the development of the Navy's capability to take offensive action from the air, starting with the targeting of Zeppelin sheds and factories, before expanding at Dunkirk and with No. 3 Wing, and culminating in the contribution to the IAF mission. What is striking about all of these bombing operations was how they were consistently waylaid by changing political and military administrations. Personality differences in the Cabinet, at the Admiralty and amongst the Air Board, contributed to repeated divergence of objectives and priorities.

The relentless assault by the Army Council and RFC against No. 3 Wing is particularly striking. It was generally assumed, by the War Office, that any activity from the inland aerodromes (especially on the Western Front) should be restricted to Army use only regardless of the fact that the Admiralty possessed the technical knowledge and machines required to conduct long-range bombing raids.

¹⁹⁸ Jones, *WIA*, vol. II, p. 253.

¹⁹⁹ Ash, *Sir Frederick Sykes*, p. 168.

Although the Navy was the first to develop long-range bombing methods, particularly under the leadership of First Lords Churchill, Balfour, and during the Air Department tenures of Sueter and Vaughan-Lee, it was ultimately the RFC that seized control of the long-range bombing force. In a stunning case of inter-service rivalry the RFC leadership, notably DGMA Henderson and RFC field commander Trenchard, insisted that the resources that the RNAS requested should be transferred to the Western Front, a request the Air Department was willing to grant only for strictly military necessity, until the pressure from the Air Board, War Office, and Sir Douglas Haig, became so strong that the Navy was forced to abandon its efforts altogether. Within a few months of the torpedoing of No. 3 Wing, the RFC reversed course and assumed control of long-range bombing, reinstating operations under the RFC's 41st Wing.

Despite the leadership role shifting to the RFC the RNAS remained involved, providing a heavy bomber squadron to operate with the newly established 41st Wing. Even after the RNAS ceased to exist in April 1918, the newly designated RAF No. 216 (Naval) Squadron remained a part of the IAF ironically still under Major-General Trenchard. Significantly it was the Navy's Handley Page bombers that proved the most effective long-range bombing aircraft although they were badly misused by Trenchard, and scattered against operational targets rather than concentrated against critical factories.

The lessons from the Navy's experience with long-range bombing are three-fold: First, the RNAS quickly developed a capability to carry out the full spectrum of bombing operations, from the initial anti-Zeppelin raids of 1914 through to the systematic tactical and operational bombing of the Dunkirk wing. With this experience behind them the RNAS developed its dedicated long-range bombing force, No. 3 Wing. This experience produced the second lesson: The War Office was perfectly willing to decry the utility of No. 3 Wing until it could assume control itself, at which point the Army failed to produce an equally dedicated bombing force, preferring to focus on tactical and operational targets more in line with existing RFC priorities. The RNAS should not have folded to the inter-service attacks against No. 3 Wing. In fact, had it been expanded and reinforced, rather than pared down and dismantled, the wing would have been positioned not only to retaliate for the Gotha bombing against England, but also to carry out the destruction of Germany's industry on an increasingly significant scale during 1918. The gap created by the disbanding of No. 3 Wing meant that there was no force available to retaliate for the Gotha bombing campaign until the 41st wing was formed in October 1917, indirectly

contributing to the public and government outcry against the way the air war was being run and thus, at least in part, justifying the conclusions of the Smuts Committee.

While Vaughan-Lee was a willing convert to the Churchill policy of long-range bombing, when he was replaced by Fifth Sea Lord Paine in 1917 the long-range bombing mission was soon abandoned and the RNAS re-refocused on ASW and fleet aviation. Thus, inter-service rivalry only partly explains the Navy's abandonment of long-range bombing leadership in 1917, an inconsistent administration helped tip the scales.

Chapter Six: The Naval Air Defence of Britain

This chapter examines the involvement of the RNAS in the air defence of Britain. Three distinct phases are identified and examined. The first phase, in which the RNAS was responsible for the entirety of Britain's air defence, coincided with the Admiralty administration of First Lord Churchill, supported by DAD Sueter. At the Admiralty Churchill oversaw the development and implementation of the telephone exchange network that became the cornerstone of Britain's air defence system, connecting RNAS air stations and anti-aircraft batteries with the Admiralty, Air Department and War Office. Churchill's resignation, in May 1915, and his replacement as First Lord by Arthur Balfour, marked the conclusion of the first phase.

The second phase commenced as Balfour transitioned the RNAS to district command beneath the SNOs, beginning in June 1915. Between then and February 1916 the RNAS role became one primarily of coastal defence, the traditional role of the Royal Navy as the frontline of defence against invasion. Early in 1916, at Balfour's request, the RFC resumed responsibility for air defence over land and the RNAS refocused on Zeppelin interception and destruction over Britain's coasts and the North Sea. This period was characterized by a dramatic expansion and re-armament of the RNAS intended to improve the efficiency of the naval air service as an anti-Zeppelin and night fighting force.

The third phase commenced in the spring of 1917, when Germany commenced its day bombing operations by airplane bombers, supported by naval airships at night, lasting until September 1917 when the offensive switched wholly to night bombing. Germany's bombers were redirected to France and the Western Front early in 1918 as wartime priorities shifted. This was a controversial period during which the entire question of air defence, and the Navy's role therein, was brought into question, ultimately leading to the creation of the RAF.

The formation of the Air Ministry in January 1918, followed by that of the RAF in April, was justified ostensibly with the aim of improving the unity and effectiveness of air defences. Historians have since argued that the Air Ministry was created primarily to deflect criticism away from the government and to appease the proponents of an imperial air service.¹ So far as

¹ John Sweetman, 'The Smuts Report of 1917: Merely Political Window-Dressing?', in *Journal of Strategic Studies*, vol. 4, no. 2 (1981), pp. 152–74. Christopher Luck, 'The Smuts Report: Interpreting and Misinterpreting the Promise of Air Power,' in *Changing War*, pp. 153–9.

the Navy was concerned the transition to the RAF merely disrupted the efforts of the RNAS to conduct its various missions, including coastal defence from enemy aircraft and Zeppelins. This chapter concludes that the RAF's priorities in fact had little to do with air defence, and that the former RNAS station and group commanders essentially carried on their former mission as best they could, often under added pressure due to the withdrawal of naval squadrons to support RAF operations with the BEF in France. The complicated and innovative contribution of the RNAS to the air defence campaign was quietly forgotten.

Churchill's Prewar Policy, Air Defence, 1912-1915

Churchill's appreciation of air defence during the pre-war period is especially significant, as it was ultimately his arrangement of 3 September 1914 with the Minister of War, Lord Kitchener, that transferred complete responsibility for Britain's air defence to the newly established RNAS.²

The need to defend against air attack first entered the British public consciousness during the Edwardian period. The sensational proposals of the invasion literature, combined with the science fiction of H. G. Wells such as his *The War in the Air*, serialized in 1908, raised concerns about Britain's possible exposure to air attack.³ The reality of the new technology was dramatically demonstrated by Louis Bleriot's famous cross-channel flight in 1909. The question of Britain's readiness to defend itself from the air was pressed home in the popular press, through publications like *Aeroplane*, a magazine founded by Charles Grey, and the *Daily Mail* and *Times* newspapers, published by the strong air advocate Alfred Harmsworth, Lord Northcliffe.⁴

The alarmism in the popular press provided a contrast to the sober preparations of practitioners in the Army such as Colonel J. E. B. Seely, the chairman of the cabinet's Air Committee, Brigadier-General David Henderson, and Major Frederick Sykes, the commander of

² Gilbert, *Winston Churchill: Young Statesman*, vol. II, p. 530. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', pp. 27-8. Gilbert, *The Challenge of War*, vol. III, pp. 65-6. Cole and Cheesman, *Air Defence of Britain*, p. 7. Captain L. S. Stansfeld, The Royal Naval Volunteer Reserve Anti-Aircraft Corps, AIR 1/648, #49 in Roskill, *Documents*, p. 168.

³ H. G. Wells, *The War In The Air* (London: The Pall Mall Magazine, 1908).

⁴ Pugh, 'Conceptual Origins of the Control of the Air', p. 111. Cumming, *The Battle for Britain*, Chapter 2, loc. 285. David Edgerton, *England and the Aeroplane: Militarism, Modernity and Machines*, Kindle ebook (London: Penguin Books, 2013), p. 4.

the Military Wing of the RFC. Sykes, in particular, considered the possibility of aerial fighting when he wrote the RFC's pre-war training manual.⁵

The Admiralty, as Pugh observed, was aware of the potential threat from German air attacks as early as 1911, approximately the same time the Army likewise began to make the connection between sea control and air control and, significantly, the need to go on the offensive to achieve it.⁶ For the Naval Wing of the RFC, air defence was an important area of discussion and experiment. The Naval Wing existed to support the Royal Navy and from the perspective of the technically literate naval service, this meant developing offensive and defensive capabilities in keeping with the navy's traditional roles, significantly, defending Britain's coasts, preventing invasion, and taking offensive action to the enemy, while keeping the fleet defended from aerial threats as they emerged.⁷

Air defence of naval facilities was a role endorsed by DAD Sueter, who was also the naval representative on the pre-war Air Committee. Sueter argued in favour of naval aircraft defending bases and facilities,⁸ and observed the difficulty that would likely be experienced with aircraft attacking airships, given the ability of an airship to out-climb any existing airplanes.⁹ The DAD's general Naval Wing policy as circulated on 29 August 1912 emphasized, foremost, the importance of naval air reconnaissance, but also included a final requirement aimed at 'Preventing attacks on Dockyards, Magazines, Oil Storage Tanks, etc. by hostile Aircraft.'¹⁰

Experimental work carried on apace at Eastchurch with the goal of developing the technical capabilities that would enable naval aircraft to act defensively. As Lieutenant Clark-Hall wrote at the beginning of 1914 'machine-gun aeroplanes are (or will be) required to drive off enemy machines approaching our ports with the intention of obtaining information or attacking with bombs our magazines, oil tanks, or dockyards'.¹¹ In June 1913 the Naval

⁵ Ash, *Sir Frederick Sykes and the Air Revolution 1912-1918.*, p. 40-3. Pugh, *The Royal Flying Corps, the Western Front and the Control of the Air, 1914-1918*, p. 31. RFC Training Manual, Pt. II, correspondence and proofs, February 1913, AIR 1/785/204/4/558. Pugh, 'Oil and Water: A Comparison of Military and Naval Aviation Doctrine in Britain, 1912-1914.', pp. 136-8. The Navy's technical manual is the Royal Flying Corps Training Manual, Part II (Naval Wing), Air Department, Admiralty, 1914, AIR 1/824/204/5/71

⁶ Pugh, 'Conceptual Origins of the Control of the Air.', pp. 66-73, 133. Pugh, *The Royal Flying Corps*, p. 19

⁷ Morgan-Owen, *The Fear of Invasion*, pp. 12-3.

⁸ Minutes of first Air Committee meeting, 31 July 1912, CAB 14/1, p. 6.

⁹ Minutes of third Air Committee meeting, 7 November 1912, CAB 14/1, p. 20.

¹⁰ Extracts from Paper by Captain Murray F. Sueter, Director of Air Department, Admiralty, dated 29 August 1912, AIR 1/652, #18 in Roskill, *Documents*, p. 59.

¹¹ Raleigh, *WIA*, vol. I, p. 270.

Ordnance Department advocated arming every naval aircraft with some form of weaponry, either machine guns, small cannons, or rockets and grenades.¹²

Churchill for his part was convinced that Germany's Zeppelin possessed the potential to seriously threaten the navy's stores and magazines, and that the only solution was to somehow prevent the airships from reaching their targets as could 'only be done by attacking them.'¹³ Churchill's counter-attack theory ultimately required locating and bombing the Zeppelin sheds themselves. Late in 1913 Churchill circulated his proposal for new aircraft including a 'fighting Seaplane,' and a 'home-service fighting aeroplane' specifically designed with countering Zeppelins in mind.¹⁴ On 21 December Churchill reiterated his intentions to Captain Sueter and the Fourth Sea Lord, stating that it was imperative that the Naval Wing should acquire 'fighting' airplanes, both to compete with the Military Wing of the RFC, but also for war purposes related to coast defence, against both enemy airplanes and Zeppelins.¹⁵

The outcome of the 1913 naval maneuvers, in which Vice-Admiral Jellicoe's red force was judged successful at landing an invasion force, without Admiral Sir George Callaghan's blue fleet being able to locate the invaders, greatly strengthened the significance of the RFC Naval Wing as a source of information.¹⁶ The importance of locating enemy forces in the North Sea, and the enemy's ability to do likewise, became increasingly significant when the German advantage in Zeppelins was taken into consideration (see Chapter Three). Churchill, cognizant of the aerial imbalance that favoured Germany, had grand intentions for the RNAS. He planned to use naval aviation first to supplement, and then ultimately supplant, the Coast Guard in the provision of coastal patrol, maritime security and search and rescue.¹⁷

Air defence was constantly on Churchill's mind and in May 1914 he called for the formation of a squadron of 'ten fighting aeroplanes' to be established at Eastchurch for the sole

¹² Grove, 'Seamen or Airmen?', pp. 20-1.

¹³ Extracts from Minutes of 122nd Meeting of C.I.D. on 6th February 1913, CAB 38/23/9, #27 in Roskill, *Documents*, p. 84. Marder, *From the Dreadnought to Scapa Flow: Volume I The Road to War 1904-1914*, p. 340.

¹⁴ Raleigh, *WIA*, vol. I, pp. 265-6.

¹⁵ Churchill to Fourth Sea Lord, DAD and D of C, 21 December 1913, #36, Some Minutes by Mr. Churchill on Aviation Matters, September-December 1913, ADM 1/8621, in Roskill, *Documents*, p. 123. Hobbs, *Royal Navy's Air Service*, p. 40.

¹⁶ Lambert, *Sir John Fisher's Naval Revolution*, pp. 284-5. Morgan-Owen, *Fear of Invasion*, pp. 222-3.

¹⁷ Churchill Minute to Colonel Seely, Secretary of State for War, 6 December 1913, ADM 1/8621, #36 in Roskill, *Documents*, pp. 119-20.

purpose of the defence of Chatham Dockyard and the Chattenden magazines and fuel tanks.¹⁸ Nevertheless, similar to the situation with regard to ASW, the theory of air defence was still ahead of any concrete countermeasures and thus there was little the navy could realistically do to defend against potential air raids by July 1914 (as against submarine attacks, see Chapter Four).¹⁹

With Britain's lead in dreadnought construction advancing by 1914, Churchill's concept of operations had solidified on a general naval offensive.²⁰ Influenced by the strategic theory of Julian Corbett, this approach identified the combined naval and military (that is, maritime) offensive as the proper attitude of the superior power in a naval conflict.²¹ Churchill hoped the general naval offensive, that he planned to commence at the outset of a war, would act to counter any offensive aerial action by Germany as an enemy.²² The RNAS component of this policy, in addition to the deployment of advanced forces to the Belgian coast,²³ would involve the raiding of Germany's Zeppelin sheds as was actually implemented at Cologne, Friedrichshafen, and Cuxhaven (see Chapters Three and Five).²⁴ This was an approach that layered a revolutionary new technology on top of the traditional maritime strategy of the Royal Navy. However, it was also an admission that the RNAS could not stop the Zeppelin raiders once airborne.

Churchill, Sueter, and Building Britain's Air Defences

With the entire Military Wing of the RFC deployed to France to support the BEF Churchill, with Kitchener's consent, placed the RNAS in charge of the nation's air defence. At the Air Department Sueter set to work developing an integrated system that utilized guns, searchlights,

¹⁸ Churchill to Secretary of Admiralty, Fourth Sea Lord, and DAD, 18 May 1914, Some Minutes by Mr. Churchill on Aviation Matters, May-June 1914, ADM 1/8621, #42, in Roskill, *Documents*, p. 139. Castle, *The First Blitz: Bombing London in the First World War*, p. 12.

¹⁹ Memorandum on 'Aerial Defence by Mr. Churchill, dated 22 October 1914, CAB 37/121/133, #54 in Roskill, *Documents*, p. 181-3. See also, Captain L. S. Stansfeld, The Royal Naval Volunteer Reserve Anti-Aircraft Corps, AIR 1/648, #49 in, Roskill, *Documents*, p. 168, also Extracts from 'Report on the Subject of the Defence of London against Aerial Attack', by Captain Murray F. Sueter, Director, Air Department, Admiralty, dated 16 October 1914, CAB 37/121/125, #52 in Roskill, *Documents*, pp. 172-9.

²⁰ Bell, *Churchill And Sea Power*, p. 38.

²¹ Julian Corbett, War Course, Notes on Strategy, Portsmouth, January 1909, CBT 6/15-16, National Maritime Museum, pp. 2-3. See also: Andrew Lambert, 'Sir Julian Corbett and the Naval War Course,' in *Dreadnought to Daring*, p. 41 & Andrew Lambert, 'The Naval War Course, Some Principles of Maritime Strategy and the Origins of "The British Way in Warfare,"' in *The British Way in Warfare: Power and the International System, 1856-1956*, by Greg Kennedy and Keith Neilson, ebook (Burlington, Vermont: Ashgate Publishing Company, 2010), 219-56. Also, John W. Gloystein, 'Mahan, Corbett, and Economy of Force in the Command of Sea and Air' (Air University, School of Advanced Air and Space Studies, 2007). pp. 28-33.

²² Lambert, *Sir John Fisher's Naval Revolution*, p. 269. Churchill, *World Crisis.*, vol. I, p. 274.

²³ Samson, *Fights and Flights*, p. 6.

²⁴ Brock and Brock, *Letters to Venetia Stanley*, p. 285.

observation posts, aerodromes, naval air stations, and a telephone exchange network to identify, locate, and attack raiding Zeppelins.²⁵ Sueter took to the task with his usual gusto and within only a few days had an appraisal of London's air defence in Churchill's hands. A more thorough appreciation, with contributions from Third Sea Lord Tudor, was bundled together with a report by the Director of Naval Operations Rear-Admiral Morgan Singer and published on 16 October.²⁶ Gun and searchlight positions were rapidly installed during September and the first telephone lines were laid on 7 October.²⁷

Soon there were 20 gun and searchlight positions operational with another five under construction.²⁸ By 22 October there were nine 3 inch, 43 pdr and four 3 pdr guns in position around London.²⁹ The gun crews were drawn from the RNVR which necessitated, on 9 October, the creation of the RNVR Anti-Aircraft Corps which was immediately placed under Sueter's authority,³⁰ with local branches established at Dover, Sheffield, and Portsmouth, between which, by December 1914, there were 33 guns in position.³¹ Mobile units, assembled from converted gun-trucks, were also formed. In November 1914 it was further arranged for the War Office to assume responsibility for the gun defences outside London, so that Sueter would not be overwhelmed with responsibility for defence of the capital.³²

Expanding the RNAS home defence squadrons was the second order of business. On 5 September Churchill intended to divide the RNAS into two groups: first a continental airplane force to attack Zeppelin sheds and enemy airbases and, second, a separate interception force to be stationed between Dover and London and supported by flights from Eastchurch, Calshot and

²⁵ Nicolas J. d'Ombrain, 'Churchill at the Admiralty, 1911-1914,' in *JRUSI*, vol. 115, no. March (1970), pp. 38-9. Ash, *Sir Frederick Sykes*, p. 35. Marder, *FDSF*, vol. I, p. 342. W. H. C. S. Thring, 'A Defence Organisation for the British Nations,' in *NRJ*, vol. 9, no. 1 (1921), p. 17.

²⁶ Sueter, *Airmen or Noahs*, p. 165. Extracts from 'Report on the Subject of the Defence of London against Aerial Attack', by Captain Murray F. Sueter, Director, Air Department, Admiralty, dated 16 October 1914, CAB 37/121/125, #52 in Roskill, *Documents*, pp. 172-9.

²⁷ Extracts from 'Report on the Subject of the Defence of London against Aerial Attack', by Captain Murray F. Sueter, 16 October 1914, CAB 37/121/125, #52 in Roskill, *Documents*, pp. 172-9. See also, Jones, *WIA*, vol. III, p. 83.

²⁸ Sueter, *Airmen or Noahs*, p. 166. Jerry White, *Zeppelin Nights: London in the First World War* (London: The Bodley Head, 2014), p. 39. Winston Churchill, *The World Crisis*, vol. I, pp. 275-7.

²⁹ Memorandum on 'Aerial Defence' by Mr. Churchill, dated 22 October 1914, CAB 37/121/133, #54 in Roskill, *Documents*, pp. 181-3.

³⁰ Captain L. S. Stansfeld, The Royal Naval Volunteer Reserve Anti-Aircraft Corps, May 1919, AIR 1/648/17/122/385, p. 1.

³¹ Churchill statement, War Council, Notes from a meeting held at 10 Downing St. on 1 Dec 1914, AIR 1/2319. White, *Zeppelin Nights*, p. 39. Jones, *WIA*, vol. III, p. 72.

³² Jones, *WIA*, vol. III, p. 157.

Hendon, linked to the Admiralty by a telephone and telegraph network.³³ In October Churchill, Tudor and Sueter, approved the construction of emergency landing grounds in London itself and a series of clearings were established, equipped initially with Bleriot headlamps and then with red acetylene lamps for night operations.³⁴ Construction taking place at Regent's Park, Kensington Gardens, Battersea Park, and Buckingham Palace.³⁵

It was not long into the new year before the Zeppelins began their deadly work. The first raid was organised by the chief of Germany's naval airship division, Fregattenkapitan Peter Strasser, and carried out on the night of 19 January 1915.³⁶ The RFC responded on 25 January by arranging for all of its air stations east of Farnborough to provide two aircraft in the event of a raid, indicating that despite RNAS responsibility air defence was in practice always a joint responsibility.³⁷ Churchill's ongoing drive for central control rapidly exerted itself, and on 27 January all RNAS ranks were split from the RFC and transferred to the Admiralty's officer register, HMS *President*, a pivotal event in the rise of the Air Department.³⁸

The London, Sheerness, Dover triangle now became the focal point for air defence and as many as 60 airplanes were stationed therein.³⁹ Seaplanes were also mobilized to intercept Zeppelins, as Flight Commander Ireland attempted to do on 16 April at Lowestoft, albeit unsuccessfully.⁴⁰ Developing a night-flying capability was essential to counter Zeppelin attacks but training progressed slowly. By September only 16 night-flying pilots were deployed to the London defence stations: two at Hendon, two at Chingford, one at Chelmsford, two at Eastchurch, two at Grain, one at Westgate and three at Felixstowe and Yarmouth.⁴¹ Resources were stretched thin.

In May the SNO Lowestoft, Captain A. L. Ellison, had taken the initiative and introduced local coastal patrols, including night patrols, with anti-Zeppelin duty foremost on his mind.⁴²

³³ Churchill, *World Crisis*, vol. I, p. 276.

³⁴ Extracts from 'Report on the Subject of the Defence of London against Aerial Attack', by Captain Murray F. Sueter, Director, Air Department, Admiralty, dated 16 October 1914, CAB 37/121/125, #52 in Roskill, *Documents*, pp. 172-9.

³⁵ Jones, *WIA*, vol. III, p. 82.

³⁶ Cole and Cheesman, *The Air Defence of Britain*, pp. 24-5.

³⁷ *Ibid*, p. 15.

³⁸ Admiralty Weekly Orders, Naval Air Service – Re-organisation, M.0160/15, 27 January 1915, ADM 1/8408/7.

³⁹ Philpott, *The Birth of the Royal Air Force*, p. 144. Castle, *The First Blitz*, p. 13.

⁴⁰ Captain-in-Charge Lowestoft and Yarmouth to Admiralty, 28 April 1915, ADM 137/2213.

⁴¹ Cole and Cheesman, *The Air Defence of Britain*, pp. 37-8. Jones, *WIA*, vol. III, p. 124.

⁴² Captain A. L. Ellison, R.N. statement at 24 May 1916 meeting of Air Board, AIR 6/1.

DAD Sueter had likewise personally issued the first operational orders for RNAS Dunkirk, established according to Vice-Admiral Reginald Bacon specifically for Zeppelin defence.⁴³ The anti-Zeppelin mission received the top priority in Sueter's general orders of 26 February and 21 June, with coastal A/S patrols, naval gunfire spotting and bombing attacks against submarine yards and power stations all lower in priority.⁴⁴ Squadron Commander Longmore's No. 1 Squadron, dispatched to Dunkirk on 26 February 1915, had been specifically ordered to 'endeavor to prevent Zeppelins and aeroplanes operating from bases in Belgium from [conducting] raids on England.'⁴⁵ Pugh described the Dunkirk and East Coast stations as forming components of a 'coherent strategy for the control of the air.'⁴⁶

Sueter for his part actually witnessed the first Zeppelin raid on London on the night of 31 May from his 'chief control position' atop the Admiralty Arch.⁴⁷ It was now clear that the Zeppelin threat was real and, despite all the measures taken so far, there was relatively little to stop the Zeppelins from attacking the metropolitan centre of Britain's empire. A few aerial victories, in addition to the successful Zeppelin shed raids, were secured nevertheless: starting with Flight Commander Bigsworth's bombing attack on LZ39 while over Ostend. Although this Zeppelin was only damaged, the results indicated that the RNAS was making at some headway. Flight Lieutenant Rex Warneford's dramatic attack on LZ37 near Ghent on 7 June, for which he won the Victoria Cross, was confirmation that the RNAS, with a degree of luck, could successfully intercept Zeppelins and bring them down.⁴⁸ The difficulty of destroying a Zeppelin with darts or bombs, however, made it clear that improved equipment was necessary if the RNAS was to achieve sustained success.

Churchill's leadership had championed the RNAS to become the first, indeed the only, line of defence against the enemy's Zeppelin raids. Churchill's doctrine, as made apparent by the actions of the RNAS and Air Department immediately after August 1914, centered on a combination of counter-offensive air strikes against the Zeppelin sheds, combined with defensive aircraft stationed at the various aerodromes and naval air stations around the east coast of

⁴³ Bacon, *The Dover Patrol 1915-1917*, vol. II, p. 217.

⁴⁴ Commodore Murray Sueter, Operations Order A.D. No. 15, Orders for Naval Air Service Units Based at Dunkirk, 21 June 1915, AIR 1/672.

⁴⁵ Longmore, *From Sea to Sky*, p. 45.

⁴⁶ Pugh, 'Conceptual Origins of the Control of the Air,' p. 292.

⁴⁷ Sueter, *Airmen or Noahs*, p. 170.

⁴⁸ Warneford was killed in a flying accident only ten days later. Jones, *WIA*, vol. III, Appendix II. Gibson, *Warneford, VC*, pp. 82-93.

England and in London. Commodore Sueter laid the groundwork for the essential anti-aircraft gun, searchlight, and telephonic communication network that was to be expanded throughout the war. Churchill deserves credit for recognizing the threat, and Sueter for mobilizing the Air Department to address it, although by the end of 1915 a great deal of work remained to be done.

The risks associated with attacking Zeppelins while airborne was still too great to guarantee success and bombing operations against the Zeppelin sheds themselves were likewise fraught with risk. What is significant about the Churchill-Sueter approach is that it demonstrated an understanding of the threat and kick-started the process of developing a defense, however tenuous the chances of success. The rapid development of munitions and doctrine during 1916 would dramatically change this situation. In a watershed reversal of policy, following Churchill and Sueter's displacement in 1915, in early February 1916 Balfour turned responsibility for Britain's air defence over to the Army.⁴⁹

Balfour: Re-Organisation and the Anti-Zeppelin Arms Race

1916 was a year of expansion and reconstitution for the RNAS, with coastal patrol replacing overland defence. New training manuals were published, helping to disseminate the wartime experience of 1915, and specially designed anti-Zeppelin ammunition was introduced. Combined with RNAS interrupter gear technology and new airplanes equipped with more powerful engines, such as the Sopwith Triplane, the RNAS now became a serious impediment to the Zeppelins' efforts.⁵⁰ RNAS aircraft could now reach the operating heights of the Zeppelins and attack them with weaponry capable of exploiting the Zeppelin's exposed hydrogen cells. In response, Germany introduced improved airships capable of reaching greater altitudes still.

As soon as he took office, Balfour had intended to reverse course on air defence. On 18 June 1915 he announced his intention to return responsibility for Britain's air defence to the War Office, reversing the Churchill-Kitchener agreement.⁵¹ At the Admiralty Board meeting of 10 September it was arranged for the Board to assume formal responsibility for the artillery defence of the London metropolitan area, prior to the handover of responsibility to the War Office.⁵²

⁴⁹ Pulsipher, 'Aircraft and the Royal Navy', p. 313.

⁵⁰ Thetford, *British Naval Aircraft*, p. 304.

⁵¹ Admiralty Board minute, 18 June 1915, ADM 167/49, p. 1.

⁵² Admiralty Board Minutes, 10 September 1915, ADM 167/49.

To take some of the pressure off Sueter, and to better manage the transition to the Army, Admiral Sir Percy Scott was appointed by Balfour on 12 September to command London's anti-aircraft defences during this interim period.⁵³ Scott, a tenacious gunnery modernizer, performed as expected and quickly built up the regional defences.⁵⁴ At the Admiralty Board meeting on 25 November it was acknowledged that the War Office would presently assume responsibility for the aerial defence of London, and at the War Council meeting four days later it was agreed that the Army should assume control over the ground-based anti-aircraft defences of London,⁵⁵ although another conference was forthcoming to work out the details.⁵⁶

Balfour was anxious to be rid of the entire affair and, further, he appeared to have been unaware of the arrangements made between Kitchener and Churchill.⁵⁷ Political pressure in the House of Commons accumulated over the summer of 1915, where it was not clear to the Members of Parliament that the Navy's air defence efforts were meeting with success, so long as the bombs kept falling on London.⁵⁸ The inability of the RNAS to stop the large raid of 31 January – 1 February 1916 added further pressure to the Admiralty to hand over responsibility to the Army.⁵⁹ The First Lord of the Admiralty insisted that the transfer of responsibility be complete by 14 February 1916.⁶⁰ Lord Curzon, then Lord Privy Seal, was able to write two days later that the Navy's duties, so far as air defence was concerned, would be focused on intercepting Zeppelins through coastal patrols exclusively.⁶¹

⁵³ Jones, *WIA*, vol. III, p. 122. Sueter, *Airmen or Noaahs*, pp. 174, 176-7. Jack Herris and Bob Pearson, *Aircraft of World War I, 1914-1918* (London: Amber Books Ltd, 2014), p. 71. Captain L. S. Stansfeld, The Royal Naval Volunteer Reserve Anti-Aircraft Corps, AIR 1/648, #49 in Roskill, *Documents*, pp. 168-9.

⁵⁴ Percy Scott, *Fifty Years in the Royal Navy*, Kindle ebook (Endeavour Press Ltd., 2015), Chapter 18. See also, Andrew Lambert, 'Scott, Sir Percy Moreton, First Baronet (1853-1924), Naval Officer and Engineer,' *ODNB*.

⁵⁵ Duties of the Royal Naval Air Service and The Royal Flying Corps, War Committee Minutes, 10 February 1916, CAB 42/8/5, pp. 4-5.

⁵⁶ Admiralty Board Minutes, 25 November 1915, ADM 167/49.

⁵⁷ Cooper, *Birth of Independent Air Power*, p. 46. Grove, 'Air Force, Fleet Air Arm - or Armoured Corps?', p. 40. Jones, Vol. III, pp. 268-9. Extracts from 'Secretary's Notes of a Meeting of War Council' held on 7 January 1915, #60 in Roskill, *Documents*, pp. 190-2. Prime Minister's statement, War Committee minutes, 10 February 1916, CAB 42/8/5. See also Memorandum on 'Aerial Defence' by Mr. Churchill, 22 October 1914, CAB 37/121/133, #54 in Roskill, *Documents*, pp. 181-2.

⁵⁸ Cole and Cheesman, *The Air Defence of Britain*, p. 90. Statement by Mr. King, 19 July 1915, & 22 July 1915, HC, vol. 73, cc. 1156, 1648.

⁵⁹ Cooper, *Birth of Independent Air Power*, p. 43.

⁶⁰ Duties of the Royal Naval Air Service and The Royal Flying Corps, War Committee Minutes, 10 February 1916, CAB 42/8/5, p. 6.

⁶¹ Extracts from Memorandum for the Cabinet by Lord Curzon, Lord Privy Seal, dated 14 February 1916, CAB 37/142, #102 in Roskill, *Documents*, p. 299. John Gloystein, 'Mahan, Corbett, and Economy of Force in the Command of Sea and Air' (MA thesis, Air University, School of Advanced Air and Space Studies, 2007), pp. 37-8. Patrick Beesly, *Room 40: British Naval Intelligence 1914-1918* (London: Hamish Hamilton Ltd., 1982), p. 142.

Field Marshal Sir John French, recalled following the disappointing Battle of Loos and appointed C-in-C Home Forces in December 1915, two months later inherited the Sueter-Scott establishment. At the beginning of 1916 this defensive force included 108 searchlights, 38 fixed guns, 25 mobile guns in London, and another 111 lights and 197 guns located around the various coastal bases and ports. At this time there were still few anti-aircraft guns established directly for the protection of the NAS, making the coastal stations vulnerable targets relative to the more significant London defences. The RNAS-RFC demarcation line was established 30 miles inland from the coast, and all aerodromes inside that limit were transferred to the Army.⁶² Although Admiral Scott had done his best, it was clear to CIGS Robertson that, as of the planned transfer date, the London defence area required an additional 75 guns and 51 searchlights, plus another 330 guns, 230 lights, not to mention 92 additional airplanes, to effectively protect the countryside around London - a serious drain on munitions that highlighted the significance of the Zeppelin threat. Minister of Munitions David Lloyd George, formerly the Liberal Chancellor of the Exchequer, did not believe these orders could be fulfilled until July 1916.⁶³

Balfour's decentralized naval administration empowered the SNOs with broad leeway to orchestrate the air defence in their districts as they saw fit. On 26 October 1915, for example, Vice-Admiral Bacon and his SNO Dunkirk, Commodore C. D. Johnson, agreed that the RNAS forces at Dunkirk and St. Pol (Longmore's No. 1 Wing),⁶⁴ were to be in close telephone contact with the Governor of Dunkirk to enable cooperation with the French air forces when intercepting Zeppelins - a demonstration of direct cooperation between local forces.⁶⁵ Balfour's system relied on decentralized control by the SNOs, but with the consequence that the RNAS was not well situated to respond to the geographically wide-ranging requirements of coastal defence (see Chapter Four). What was actually needed were supra-district or regional commands to unite the disconnected RNAS stations into coherent groups, better suited to take advantage of intelligence, equipment, and inter-service cooperation.

The basis for this supra-district structure actually existed in the form of the senior district commanders. The most significant of these were the Rear-Admiral East Coast of England

⁶² Cole and Cheesman, *The Air Defence of Britain*, p. 97.

⁶³ Duties of the Royal Naval Air Service and The Royal Flying Corps, War Committee Minutes, 10 February 1916, CAB 42/8/5, pp. 6-7. War Committee minutes, 10 February 1916, AIR 1/2319, Appendix.

⁶⁴ Bacon, *The Dover Patrol*, vol. II, p. 223.

⁶⁵ SNO Dunkirk to Sub-Chief General Staff, 27 October 1915, ADM 137/2278.

(George Ballard), the Commodore Lowestoft (Ellison), the C-in-C Dover Patrol (Vice-Admiral Bacon), the C-in-C the Nore (Admiral of the Fleet Sir George Callaghan), and the Harwich Force commander (Commodore Tyrwhitt). Each of these regional naval commands was assisted by his associated senior RNAS commanders. Admiral Callaghan for example was supported by Wing Commander Henry Smyth-Osbourne, who acted in the capacity of District Commander of Aircraft. Wing Commander Smyth-Osbourne controlled the stations at Eastchurch, the Isle of Grain and Westgate and, on 12 June 1916, he was appointed directly to the C-in-C Nore's staff.⁶⁶ Likewise the Dover Patrol under Vice-Admiral Bacon was supported by RNAS Dunkirk and Dover under the command of Wing Captain Charles Lambe.

With the defensive duties now split between the RNAS and RFC, the need for inter-service cooperation would only increase. Responding to this concern Asquith's coalition government established the JWAC as the first wartime inter-service air organisation, and appointed Lord Derby to the chair on 15 February. Lieutenant-Colonel Maurice Hankey, the War Committee Secretary, had proposed the formation of the JWAC hoping to recreate the consultative atmosphere of the pre-war Air Committee. In theory the JWAC would fill the policy vacuum created by Churchill's departure, while also functioning as a forum to resolve issues regarding spheres of responsibility and details of supply between the RFC and RNAS.

The Air Department soon expressed its agreement with Balfour's revised air defence policy. DAS Vaughan-Lee presented a report to the JWAC on 3 March in which he summarized his belief that the RNAS should defeat enemy aircraft attempting to reach the coasts, leaving inland air defence to the RFC. Vaughan-Lee emphasized that the RNAS was responsible for air defence against 'all hostile aircraft attempting to reach this country'.⁶⁷ The interim JWAC report, commissioned on 24 February and in print by 20 March,⁶⁸ contained a concise statement on air defence: the RNAS was to 'patrol our own coasts, to look out for [the] enemy's ships and submarines, [and] to meet and repel the enemy's aircraft, and also, possibly to discover minefields.' To achieve these goals the Navy was empowered 'to provide the aircraft required to co-operate with and assist their Fleets and Coast Patrol Flotillas, and to watch the coast, and to

⁶⁶ Commander Smyth-Osbourne's statement at the Air Board meeting of 24 May 1916, AIR 6/1. Service Record for Wing Captain Henry P. Smyth-Osbourne, ADM 273/2, p. 35.

⁶⁷ Vaughan-Lee, Joint War Air Committee. Extracts from Paper Air 4, dated 3 March 1916, ADM 1/270, #106 in Roskill, *Documents*, pp. 309-11. Cole and Cheesman, *The Air Defence of Britain*, p. 43.

⁶⁸ Joint War Air Committee, Interim Report, 20 March 1916, AIR 1/2319.

organize and maintain such Flying Stations as are required to enable their aircraft to undertake duties.⁶⁹ Nevertheless, the JWAC report on RNAS duties placed home defence as third in priority to fleet work and long-range bombing (see Chapter Five).⁷⁰ The JWAC report did however recognize that the RNAS was the correct service to undertake these roles, and that there was a significant interrelationship between coastal patrol, fleet work, and ASW (see Chapter Four).

As the rivalry between the two air services heated up, DGMA Henderson used the JWAC as a platform to criticize perceived inter-service supply duplication, something Vaughan-Lee, Sueter and Wing Commander Briggs, the naval representatives on the JWAC, flatly denied.⁷¹ What was true was that the Navy was not specifically prioritizing the procurement of fighter aircraft. As of February the RNAS representatives had stated that only 114 aircraft, of the planned 152, were operational for home defence purposes, not counting the eight small flying boats, 24 reconnaissance machines and six fighters at Dunkirk.⁷² For the time being the RNAS had to make due with a number of obsolete B.E.2c airplanes.⁷³ The RFC, aware of the Navy's position as the first-line of defence, agreed that the RNAS should receive precedence for supply.⁷⁴ By March the RNAS possessed 52 large floatplanes and flying boats, 70 small seaplanes, but only 44 fighter aeroplanes specifically for home defence purposes.⁷⁵

The collapse of the JWAC, the reasons for which are significantly related to the theoretical development of a united air service,⁷⁶ prompted Lord Curzon to assume responsibility for a new Air Board although the same underlying issues remained. The new Board first met on 22 May, with Rear-Admiral Tudor and Rear-Admiral Vaughan-Lee representing the Navy.⁷⁷ The mandate for discussion was primarily supply, and the board's powers were to be considered advisory only.⁷⁸ After lengthy deliberations during the summer of 1916 the Board's first report

⁶⁹ Ibid.

⁷⁰ Joint War Air Committee, Interim Report, 20 March 1916, AIR 1/2319, p. 5.

⁷¹ Note by the Naval Representatives on the Joint War Air Committee. J.W.A.C.3, undated but laid before the Committee on 23 March 1916, AIR 1/2319, #110 in Roskill, *Documents*, pp. 321-2.

⁷² Machines Available, Naval, Joint War Air Committee, 29 February 1916, AIR 1/2319.

⁷³ Director Air Services, Present Deficiencies and Future Requirements of the Royal Naval Air Service, Joint War Air Committee, 22 March 1916, AIR 1/2319.

⁷⁴ Policy of Army Council with Regard to Royal Flying Corps (Military Wing), JWAC, 2 March 1916, AIR 1/2319, p. 2.

⁷⁵ Table 2, Policy of the RNAS, Joint War Air Committee, March 1916, AIR 1/2319.

⁷⁶ Cooper, *Birth of Independent Air Power*, p. 47.

⁷⁷ Minutes of the First Meeting of the Air Board, 22 May 1916, AIR 6/1.

⁷⁸ Jones, *WIA*, vol. III, p. 272.

was issued in October. The report was in fact a highly polemical document, with Curzon denouncing the Admiralty for a failure to cooperate.⁷⁹ Curzon, like Montagu (Derby's deputy) and Churchill before him, believed that ultimately an Imperial Air Service, that would theoretically be capable of uniting the empire by air transport and at lower cost than either an army or navy, represented the future of Britain's imperial defence and thus justified the necessity of unifying the RNAS and RFC under a single ministry.⁸⁰ Balfour and Vaughan-Lee were naturally enough opposed to this measure, as it would have prevented the services from determining their own requirements, and thus Curzon found his efforts at unification routinely frustrated.⁸¹

The Importance of Signals Intelligence and Reconnaissance

Essential to the RNAS air defence system was the collection and dissemination of information. The Admiralty was constantly receiving intelligence from its various naval squadrons and flotillas, shore observers, the light vessels, and of course from the RNAS. Intercepted communications from Germany's W/T network provided advanced warning of incoming raids, and RNAS patrol aircraft or RN surface vessels were usually the first to make contact approaching Zeppelins. Indeed, the Admiralty's intelligence network was a central pillar of the homeland defence establishment.

The first warning of a raid was usually received by the Naval Staff's Room 40, headed by Sir Alfred Ewing, who reported to the Director of Naval Intelligence Captain Reginald William Hall. Hall in turn relied upon Commander Herbert W. W. Hope as the liaison between Room 40 and the essential D/F radio stations along the English east coast, where communications between approaching Zeppelins were intercepted.⁸² These stations served a double purpose, on the one hand providing navigational support for the Royal Navy's warships and on the other, intercepting German transmissions for Room 40. The Zeppelins themselves also sent signals to Germany's own D/F system, established in 1915, to position themselves when forming up for night raids. As such the Zeppelins were particularly susceptible to signals intelligence intercepts between 1915

⁷⁹ Cooper, *Birth of Independent Air Power*, p. 56. Extracts from First report of the Air Board, addressed to the War Committee and dated 23 October 1916, AIR 1/2311 and CAB 22/75, #140 in Roskill, *Documents*, pp. 389-404.

⁸⁰ Extracts from Memorandum for the Cabinet by Lord Curzon, Lord Privy Seal, dated 14 February 1916, CAB 37/142, #102 in Roskill, *Documents*, pp. 297-301.

⁸¹ David Gilmour, *Curzon, Imperial Statesman* (New York: Farrar, Straus and Giroux, 2003), p. 453.

⁸² Marder, *FSDF*, vol. II, pp. 133-4. Black, *British Naval Staff*, p. 187.

and early 1916. If communications between the Admiralty and the NAS had been well established (as was not always the case, for example with RNAS Great Yarmouth early in the war), RNAS aircraft could be prepared to intercept with a reasonable degree of lead time, although the potential success of any interception mission was restricted early in the war due to lack of suitable ammunition and later by the Zeppelin's height-climbing characteristics.

When the Zeppelins left their bases to conduct raids they sent a signal back to their headquarters indicating that the airships had switched to the compromised signals code book, HVB, with the intent of protecting the current naval codes if forced to land in enemy territory. When Britain's Naval Intelligence Division, or War Office's Military Intelligence Department, therefore intercepted an HVB code communication it was known that Zeppelins were preparing for a raid. This practice, recognized by the Zeppelin command as an error and halted by the end of 1916, was, until that time, a certain giveaway that the Zeppelins were *en route* to raid Britain.⁸³ HVB was replaced by the newer AFB code aboard Zeppelins early in 1916, however a copy of the new codebook was captured and sent to Room 40 from the wreckage of *L32* when that Zeppelin was shot down by the RFC early on 24 September 1916.⁸⁴

Once intercepted, Zeppelin radio transmissions were referred to Room 40 where they were '...easily read by the British.'⁸⁵ The result of this effort was to greatly aid the home defences in preparing for and locating approaching Zeppelin raids (and for tracking U-boats and German surface vessels). Incidentally, as was the case with the construction of the coastal NAS, the vital D/F stations were at first established only on the east coast, a situation that became critical in 1917 when the submarine war expanded to the western approaches (see Chapter Four).⁸⁶

Through these methods, and despite the uncertainty of communications resulting from early telephone and W/T technology, intelligence consistently provided the RNAS coastal stations with advance warning, even if the resulting air (or sea) interception efforts were not successful such as was the case on the significant 1 February 1916 raid.⁸⁷ Advanced warnings were not only useful for the RNAS, but also for the Grand Fleet: the position reports made by the

⁸³ Beesly, *Room 40*, p. 141.

⁸⁴ Beesly, *Room 40*, p. 145. Storey, *The Zeppelin Blitz*, Chapter 2, loc. 3771.

⁸⁵ Beesly, *Room 40*, p. 70.

⁸⁶ Black, *British Naval Staff*, pp. 186-7.

⁸⁷ Cole and Cheesman, *Air Defence*, p. 85.

Zeppelins heading to raid Rosyth on the morning of 2 April were detected and reported by the Admiralty to Admiral Jellicoe and Vice-Admiral Beatty, warning them of the inland north eastern objective of the incoming Zeppelins and providing time for the two to sail.⁸⁸

The Air Department was continuously expanding its telephone network to include searchlight control points, anti-aircraft gun emplacements, defensive aerodromes, all linked directly to the War Office and Admiralty HQs.⁸⁹ This information exchange was like all wartime innovations - an imperfect system. Gaps in the network existed. There was no direct telephone line between the Yarmouth Air Station and the C-in-C Great Yarmouth as late as February 1916, for example.⁹⁰ This had implications for the celerity of response, as demonstrated by the Zeppelin raid against Yarmouth on the night of 17 August 1915. The approaching Zeppelins were reported by the Admiralty to Great Yarmouth at 7.36 pm, and then confirmed at 8.30 pm by radio reports from HMS *Kingfisher*, a river gunboat, yet the first airplanes were not in the air until 10 pm, when they searched but without making contact.⁹¹

Indeed, prompt communication between the NAS and the Air Department was not always possible as the telephone lines could become congested to the point of uselessness, or be destroyed by enemy action. In certain cases the fragile wires were carried away by RNAS aircraft attempting to land at night, or shot-through by anti-aircraft fire.⁹² The system could be jammed or 'spoofed' by the Zeppelins themselves, as the airships carried powerful W/T sets. Zeppelins could even jam local ship-to-station W/T transmissions, as was reported by destroyers and tenders off Lowestoft and Great Yarmouth during the night raid of 19 January 1915.⁹³ False and inaccurate reports from the air stations could also cause wasted effort.⁹⁴

⁸⁸ Jones, *WIA*, vol. III, p. 196. Cole and Cheesman, *Air Defence*, pp. 122-3.

⁸⁹ Oliver Schwann, ADAD, Changes in Administration of the Naval Air Service: Report of Committee, 4 January 1915, ADM 1/8408/7, p. 2. Extracts from 'Report on the Subject of the Defence of London against Aerial Attack', by Captain Murray F. Sueter, Director, Air Department, Admiralty, dated 16 October 1914, CAB 37/121/125, #52 in Roskill, *Documents*, p. 177.

⁹⁰ C-in-C Lowestoft to Admiralty, 20 February 1916, ADM 137/2213.

⁹¹ Commander H. C. Sherbrooke SNO Great Yarmouth to Captain-in-Charge Lowestoft, 18 August 1915, ADM 137/2213.

⁹² H.M. Naval Base, Great Yarmouth, reports, 29 January 1915, ADM 137/2213, p. 13. Lieutenant Colonel commanding 1/25 Cyclist Battalion to Captain-in-Charge Lowestoft, 25 September 1915, ADM 137/2213. C-in-C Lowestoft & Yarmouth to Admiralty, 20 February 1916, ADM 137/2213. Flight Sub-Lieutenant F. Reeves to CO Air Stations Great Yarmouth, 26 April 1916, ADM 137/2213, p. 2. Cole and Cheesman, *Air Defence*, p. 21.

⁹³ Ministry of Defence Air Staff, *British Air and Space Power Doctrine: AP 3000 Fourth Edition* (Ministry of Defence, 2009), p. 40. H.M. Naval Base, Great Yarmouth, reports, 29 January 1915, ADM 137/2213, p. 12.

⁹⁴ C-in-C Lowestoft to Commander, RNAS Great Yarmouth, 27 November 1915, ADM 137/2213.

Considered in context, the Admiralty's intelligence collection effort and telephone exchange network were cutting edge technology for 1915-1916, and routinely provided ample warning to the east coast air stations. It is interesting to observe that it was fully possible to identify and track approaching Zeppelins well over a year before the suitable equipment and training existed to ensure their destruction. When the Zeppelins were superseded by the Gothas in 1917 the Germans were able to somewhat neutralize this intelligence advantage as warning times dropped from hours to mere minutes. The best chance of advance warning in the case of the Gotha bombers was to be found in patrolling RNAS aircraft and Royal Navy warships, observers aboard the fixed light vessels around the North Sea, and with the observation posts and searchlight stations in England itself.

1916, Re-armament, Re-training

As the political drama stemming from the ongoing Zeppelin bombardment of England continued to produce pressure for greater inter-service cooperation, the pace of the anti-Zeppelin campaign itself was accelerating. Balfour's reforms, emphasizing closer cooperation between the RNAS and the Navy's surface assets, generated some interesting results. Royal Navy warships provided an unexpected level of support, protecting the approaches to key waterways and acting as mobile anti-aircraft batteries for the under-protected coastal air stations themselves.⁹⁵ Indeed, flotilla craft were routinely utilized not only as gunnery platforms, but also for anti-Zeppelin patrol and early warning. Trawlers at Yarmouth were tasked specifically with anti-Zeppelin patrol in September 1915.⁹⁶ Zeppelin *L9*, bombing Hull on 6 June 1915, was attacked by guns fired from HMS *Adventure*, a Yarrow river gunboat, although this was not enough to prevent *L9*, under the command of the determined, iconoclastic, Kapitanleutnant Heinrich Mathy from attacking his target.⁹⁷

Lowestoft, the headquarters of the district in which the Great Yarmouth NAS was located, was the scene of a significant number of ship-based anti-aircraft engagements during 1915 and 1916. Warship anti-aircraft fire often represented the only means of defence, as

⁹⁵ Director Air Services Rear-Admiral Vaughan-Lee, Defence of Air Stations from Aircraft Attacks, 4 February 1916, AIR 1/148.

⁹⁶ Jones, *WIA*, vol. III, p. 118.

⁹⁷ Jones, *WIA*, vol. III, p. 103. Lieutenant Commander O. F. Murray, Harwich, to Admiral of Patrols, Immingham, 7 June 1915, ADM 137/2241, p. 2.

airplanes could only be sortied in time to intercept incoming attacks either with advance notice, such as was provided by the Admiralty's Room 40, or with luck. On the night of 13 October 1915 for example, HMS *Isle of Wight* used its 3 pdr gun to attack two of the five Zeppelins that were on a mission to raid London, although no damage was inflicted.⁹⁸ The torpedo gunboat HMS *Halcyon* employed its Maxim machine guns and 4.7 inch gun against an enemy seaplane as it conducted a bombing attack against Lowestoft on the morning of 20 February 1916,⁹⁹ and the torpedo gunboat HMS *Dryad* used its searchlight to track a Zeppelin the morning of 1 April near Lowestoft.¹⁰⁰ These limited defensive capabilities of were representative of the sparse deployment of stationary guns outside of London.

In January 1916 the monitors of the Dover patrol were massed at the entrance of the Thames to prevent Zeppelins from using that waterway for navigation purposes, and four gunboats were further equipped with anti-aircraft guns and situated at Brightlingsea, Lowestoft, the Humber and the Wash to act as floating batteries.¹⁰¹ On 31 January, following the interception of signals intelligence from sortieing Zeppelins, Commodore Tyrwhitt was ordered to dispatch a light cruiser patrol supported by the trawlers *Kingfisher* and *Cantatrice*, both specifically equipped with seaplanes for anti-Zeppelin operations. In this case however, these warships were unable to locate the approaching Zeppelin formation due to thick fog.¹⁰² With advance notice from the Admiralty on 2 April, Admiral Jellicoe deployed a light cruiser squadron and four destroyers from Rosyth in an unsuccessful attempt to intercept returning Zeppelins then engaged in raiding Rosyth that evening.¹⁰³ Light cruisers and other warships were frequently used for anti-aircraft purposes and on occasion achieved some success, such as during the Tondern raid of 3 May when the light cruisers *Galatea* and *Phaeton* actually shot down Zeppelin *L7*. On this occasion, furthermore, the Royal Navy submarine *E31* was able to rescue seven of the downed Zeppelin's crew.¹⁰⁴ These cases demonstrate that during 1916 the navy's warships played an increasingly important role in the overall anti-Zeppelin effort.

⁹⁸ H. G. Sherbrooke C-in-C Yarmouth Naval Base to Lowestoft, forwarded to Director Admiralty Intelligence Division 18 October 1915, ADM 137/2213. Jones, *WIA*, vol. III, p. 129.

⁹⁹ C-in-C Lowestoft to Admiralty, 20 February 1916, ADM 137/2213.

¹⁰⁰ Lieutenant Commander HMS *Dryad* to C-in-C Lowestoft, 1 April 1916, ADM 137/2213.

¹⁰¹ Corbett, *Naval Operations*, vol. III, p. 277. Jones, *WIA*, vol III, p. 106.

¹⁰² Jones, *WIA*, vol III, pp. 135-6.

¹⁰³ Jones, *WIA*, vol III, p. 199. Storey, *The Zeppelin Blitz*, Chapter two, loc. 2643.

¹⁰⁴ Kemp credits *E31* with shooting down *L7*: P. K. Kemp, *H. M. Submarines* (London: Herbert Jenkins Ltd., 1953), p. 120. Corbett, *Naval Operations*, vol. III, p. 310. Appendix I, German Naval Airships 1912-1918, Jones, *WIA*, vol. III. Robinson, *The Zeppelin in Combat*, p. 163.

Submarines and seaplane carriers also formed an essential component of the Navy's anti-Zeppelin effort. At Churchill's recommendation in 1915, the submarines *E4* and *E6* were fitted with 6 pdr anti-aircraft guns and on 1 September were sent to the Heligoland approach to patrol for Zeppelins. Both submarines spotted Zeppelins, *E6* even managed to engage *L9* on 4 September, although without success.¹⁰⁵ On 6 March 1916 DAS Vaughan-Lee intended to have the SNO Lowestoft and C-in-C East Coast of England work in tandem, utilizing the converted seaplane carriers HMS *Brocklesby* and *Killingholme* which were fitted with two to three Sopwith seaplanes.¹⁰⁶ Support would be provided by the seaplane carriers stationed at Harwich and the Humber including the seaplane carrier HMS *Vindex*, loaned to the Fifth Light Cruiser Squadron to assist in the defence of Lowestoft in November 1915. The concept was to deploy the carriers to designated locations from which they could launch their seaplanes in the hope of catching a transiting Zeppelin.¹⁰⁷

Vindex and *Brocklesby* were put to good use in 1916. The former, escorted by four destroyers and the cruiser HMS *Conquest*, deployed 50 miles off Lowestoft on 2 August and spotted Zeppelins that were fired upon by HMS *Conquest* although without any hits recorded. *Vindex* launched Flight Lieutenant Charles T. Freeman in a Bristol Scout from its flight deck to chase the Zeppelin, and during this chase Freeman located and attacked *L17*, although again without success.¹⁰⁸ *Brocklesby* meanwhile deployed two Sopwith Schneiders from its location 40 miles northwest of *Vindex*, and the seaplanes managed a brief but easily avoided attack against what was likely *L13* before returning to Yarmouth.¹⁰⁹

As the RNAS expanded so did its training establishment. The training regime for RNAS pilots now proceeded in phases, beginning with disciplinary training at the Crystal Palace, followed by 20 to 24 hours solo flight training conducted at Eastchurch, where the gunnery school was located and observation and bomb dropping was also taught.¹¹⁰ Initial training was completed at Chingford, where dual and solo flying as well as aircraft familiarization was

¹⁰⁵ Jones, *WIA*, vol III, pp. 117-8.

¹⁰⁶ Jones, *WIA*, vol. III, p. 135.

¹⁰⁷ Rear-Admiral Vaughan-Lee, Proposed Operations to Deter Hostile Airships from Raiding England, 6 March 1916, AIR 1/148.

¹⁰⁸ Freeman was forced to ditch, and was later interned in Holland. Jones, *WIA*, vol III, p. 216. Cole and Cheesman, *The Air Defence of Britain*, p. 143.

¹⁰⁹ Cole and Cheesman, *The Air Defence of Britain*, p. 144.

¹¹⁰ Bartlett, *Bomber Pilot*, p. 17.

taught.¹¹¹ RNAS Cranwell was opened on 1 April 1916 under the leadership of Captain Godfrey Paine, hitherto the commandant of the CFS, Upavon.¹¹² Training at Cranwell included such air defence related topics as ‘cross-country flying, navigation, engines, aerial gunnery, bomb-dropping, photography, and wireless telegraphy.’¹¹³ Candidates took a final exam at Cranwell and were then posted to their assigned NAS.¹¹⁴ It was not until September 1917, however, that an RNAS school specifically for teaching air fighting was established at Freiston.¹¹⁵

The July 1916 armaments training manual is representative of the Air Department’s effort towards improving air defence training during the pivotal 1916 expansion. RNAS priorities identified by the handbook included the ‘attack [of] enemy aircraft by heavier-than-air machines,’ while the first topic discussed was attacking lighter-than-air machines with small 10 to 20 lb bombs.¹¹⁶ Significantly, the manual included two chapters on pedagogy and instruction, including three sample teaching aids for the Lewis gun, the RNAS bomb-mirror Mark II, and aiming diagrams for air fighting.¹¹⁷ Section M, Instructional, provided almost 70 pages of lectures on subjects such as heavy guns in aircraft, anti-aircraft attack, bomb sighting, gunfire spotting, machine-gun training, Lewis gun instruction, explosives and other subjects, including the instructions supplied to the RFC machine gun training school at Hythe.¹¹⁸ The 54-day training regime outlined by the armament handbook was designed to provide a broad range of subject familiarization, shooting practice, drill and technical instruction, by the end of which the trained gunner would be able to handle and fire the Davis or Vickers guns, strip and reassemble a Lewis or Vickers gun, un-jam a variety of guns, and shoot to hit stationary and moving targets (towed box-kites, cars, and boats) while airborne.¹¹⁹ Specifically addressed was attacking ‘ships from right ahead, turning and crossing their bows at an angle of 45° to their course,’ thus

¹¹¹ In March 1916 the education program at RNAS Chingford involved lectures on aerodynamics, engines, navigation, and meteorology, Bartlett, *Bomber Pilot*, p. 16.

¹¹² Jones, *WIA*, vol. V, p. 439.

¹¹³ Jones, *WIA*, vol. V, p. 440.

¹¹⁴ Bartlett, *Bomber Pilot*, pp. 18-9.

¹¹⁵ Jones, *WIA*, vol. V, p. 443fn.

¹¹⁶ Handbook of Aircraft Armament, July 1916, C.B. 1161 authorized by Vaughan Lee, ADM 186/165, p. 2.

¹¹⁷ Section L, Teaching Apparatus. CB 1161, Handbook of Aircraft Armament, Air Department, July 1916, ADM 186/165.

¹¹⁸ Section M, Instructional, CB 1161, Handbook of Aircraft Armament, Air Department, July 1916, ADM 186/165, p. 17.

¹¹⁹ *Ibid*, pp. 18-9.

simulating the safest and surest method of Zeppelin attack.¹²⁰ Pugh concluded that this manual demonstrated the high importance that the RNAS placed on the development of air defence capabilities.¹²¹

Night flying training also developed during 1916. The C-in-C the Nore, Admiral Callaghan, was a leader when it came to solving the technical hurdles of night landing at the air stations under his command. On 8 July Callaghan circulated his recommendation for a night recognition system. Using coloured Very lights he intended for his system to encompass the Nore, Dover and Harwich regions, including Army commands.¹²² Earlier, on 6 March, the DAS had been informed of recommendations for using blue Very lights from the RNAS Commander, Calshot, a station within the C-in-C Portsmouth's area of responsibility.¹²³ By the end of April the Very light scheme had been well developed and was used to inform nearby airfields to light their landing flares when a friendly aircraft was nearby.¹²⁴

The RFC was having difficulty with its night flying capability as well. Although the equipment and experience of the Army had advanced significantly over the summer of 1916, so had the requirements of the Western Front during the Somme battles.¹²⁵ The RFC's supply of night-trained pilots was only slowly recovering by February 1917,¹²⁶ while home defence requirements only increased. That same month, during the re-arming for General Nivelle's Aisne offensive, 77 of 198 'trained night-flying pilots' were withdrawn for duties overseas.¹²⁷ Indeed, the RFC's tendency to prioritize resources for the Western Front meant that often the home defence squadrons were under-manned and ill-equipped, putting more pressure on the RNAS to deliver successful interceptions before the Zeppelin raiders could reach England's coasts.

The final area of development during 1916, crucial for the defeat of the Zeppelins, was the introduction of new types of ammunition and weaponry specifically designed to improve the chances of aerial confrontation between defence pilots and the raiding Zeppelins. The air-minded Third Sea Lord, Rear-Admiral Tudor, responsible for naval material, chaired an Admiralty

¹²⁰ Section M, Instructional, CB 1161, Handbook of Aircraft Armament, Air Department, July 1916, ADM 186/165, p. 22.

¹²¹ Pugh, 'Conceptual Origins of the Control of the Air', p. 322.

¹²² Admiral G. A. Callaghan, Nore Special order #1387 –Recognition Signals for Friendly Aircraft at Night, AIR 1/148.

¹²³ Director Air Services to CO RNAS Calshot, 9 March 1916, AIR 1/148.

¹²⁴ Flight Sub-Lieutenant G. W. Fane to CO Naval Air Station Great Yarmouth, 26 April 1916, ADM 137/2213

¹²⁵ Cole and Cheesman, *The Air Defence of Britain*, pp. 96-7.

¹²⁶ *Ibid*, p. 188.

¹²⁷ Jones, *WIA*, vol. V, p. 24.

conference on 11 August on the subject of armament.¹²⁸ The dilemma was that the more equipment, munitions, guns, grenades, darts and bombs that the fighter was equipped with, the less likely that it would be able to ascend to the heights required to engage the Zeppelins, as was pointed out by Rear-Admiral Tudor on 9 August.¹²⁹ What was needed was a simple and effective ammunition for the defence fighter's weapons that would damage or destroy a Zeppelin on contact. There were plenty of choices for armament. Incendiary ammunition, authorized for War Office and Admiralty use by the War Committee on 25 November 1915, had been under investigation and development for some time.¹³⁰ Supplies of high quality incendiary ammunition, also known as 'general' and 'guaranteed' or 'K' ammunition - possibly for secrecy and legal purposes - remained short and ammunition imperfections, especially in terms of incendiary, explosive and tracer bullets, could prove disabling during a counter-Zeppelin attack (for example, on 5 September 1917 a DH4 flown from Great Yarmouth against *L44* encountered three weapons jams and a burst breech, crippling the aircraft's attack).¹³¹ The Sparklet, Pomeroy, Brock, Buckingham, Kynocks, and Greenwood & Batley ammunition were all available for Lewis, Hotchkiss, Vickers, Maxim, Colt, and Chauchat machine guns, with the RNAS preferring Lewis, Vickers, Maxim, and the Farquhar-Hill rifle, all of which could fire Buckingham incendiary ammunition.¹³²

This steady technological progress yielded results by the end of 1916 and the RNAS anti-Zeppelin tally by the end of the year was significant. Several Zeppelins had already been destroyed in their sheds, starting with *ZX9* at Dusseldorf, October 1914, and followed by *LZ38* at Evre, bombed by Flight Lieutenant J. P. Wilson and Flight Sub-Lieutenant J. S. Mills from Dunkirk on 7 June 1915. *LZ37* was caught returning from the Zeppelin raid against London that evening and was destroyed by Sub-Lieutenant Warneford, whose primary target had been the

¹²⁸ At the time, the RFC was experimenting with .45 Pomeroy incendiary bullets fired by converted Maxim machines guns, as well as 11b Vickers guns. Cole and Cheesman, *The Air Defence of Britain*, p. 108.

¹²⁹ *Ibid*, pp. 108-9.

¹³⁰ Use of Explosive Bullets against Hostile Airships. Memorandum by the Chairman of the Air Board, 20 July 1916, AIR 1/2319.

¹³¹ Specially Selected .303-inch ammunition for Royal Naval Air Service, 10 October 1916, MUN 4/2424. Joseph Morris, *German Air Raids on Britain 1914-1918* (East Sussex: The Naval & Military Press Ltd, 1993), pp. 118-20. Gamble, *The Story of a North Sea Air Station*, p. 261fn.

¹³² Cole and Cheesman, *Air Defence*, p. 169. Section D, Ammunition, & Section H, Gun Sights, & Section G, Q. F. and Machine Guns, CB 1161, Handbook of Aircraft Armament, Air Department, July 1916, ADM 186/165, p. 2.

Berchem St. Agathe shed.¹³³ *L21* was destroyed by naval pilots off Lowestoft on 28 November 1916, shot down by Flight Lieutenant E. Cadbury flying from Burgh Castle and Flight Sub-Lieutenant E. L. Pulling flying from Bacton.¹³⁴ Combined with victories secured by the RFC home defence squadrons over London, the danger of the Zeppelins had been significantly reduced by the new year.

Britain's Air Defence in 1917: Defeat of the Zeppelins, Beginning of the Gotha Raids

RNAS and RFC fighters inflicted heavy losses on the Zeppelins during 1916, forcing Zeppelin leader Strasser to adjust his tactics.¹³⁵ As the naval Zeppelin division re-armed with height-climbing airships the responsibility for raiding England passed to the German Army's new Gotha bombers.¹³⁶ The 28 August 1916 appointment of Paul von Hindenburg as Chief of the General Staff, with Erich Ludendorff as his Quartermaster General, produced immediate reforms for Germany in the West.¹³⁷ The army air service was reformed after October as the *Luftstreitkräfte*, under the overall command of *Kommandierender* General Ernst von Hoeppner. The actual bombing force, at first only one squadron and known in March 1917 as *Kampfgeschwader I* (Kagohl I), was soon supplied with Gotha IVs under the command of Hauptmann Ernst Brandenburg and Hauptmann Rudolf Kleine.¹³⁸ The Gothas were meant to deliver a devastating psychological blow to the metropolis of London, coinciding with the re-introduction of the unrestricted submarine campaign targeting merchant shipping, thus delivering a double blow to paralyze Britain's war effort.¹³⁹ The fast and maneuverable bombers, flying in formation and well defended by overlapping machine guns, were not only more effective than the Zeppelins but also far more difficult to intercept. The naval Zeppelins, still under the authority of the relentless *Fregattenkapitan* Strasser, were now deployed as a supporting element to the Gothas.

¹³³ Robinson, *Zeppelin in Combat*, p. 97. See also Cole and Cheesman, *Air Defence*, pp. 60-1. O'Moore Creagh & E. M. Humpris, *The V.C. and D.S.O. Book*, 3 vols. Naval & Military Press reprint (London, The Standard Art Book Co. Ltd., 1920), p. 169.

¹³⁴ Cole and Cheesman, *The Air Defence of Britain*, pp. 179, 182-3.

¹³⁵ Robinson, *The Zeppelin in Combat*, pp. 225-6.

¹³⁶ Jones, *WIA*, vol. V, p. 1. Morris, *German Air Raids on Britain*, p. 160.

¹³⁷ Roger Chichering, *Imperial Germany and the Great War, 1914-1918* (Cambridge: Cambridge University Press, 2004), pp. 74-6, 91.

¹³⁸ Fredette, *The First Battle of Britain*, p. 37.

¹³⁹ *Ibid*, pp. 36-7. Walter Goerlitz, *The History of the German General Staff, 1657-1945*, trans. Brian Battershaw (New York: Frederick A. Praeger, Publishers, 1961), pp. 185-6.

The RNAS and the other coast defence forces were now faced with a new kind of threat but it was still RNAS fighters that provided the best means of interception: during the Gotha's return journey over the North Sea when the bomber crews were fatigued and equipment was strained. The first Gotha raid was preceded by a Zeppelin raid of six airships, and Suffolk was bombed via Harwich and Sheerness, but London had been the goal. That night the RNAS flew 32 sorties, 42% of the total home defence (RNAS and RFC) sorties flown, excluding Dunkirk.¹⁴⁰

The Gothas then attacked Folkestone in broad daylight on 25 May, followed by an assault on Sheerness on 5 June and finally against London on 13 June.¹⁴¹ The Folkestone raid was intercepted as it was returning, first by Flight Sub-Lieutenant Reginald Leslie in a Sopwith Pup from Dover, and then by nine RNAS Sopwith Pups from No. 4 and No. 9 Squadrons, Dunkirk, during which one enemy bomber was destroyed.¹⁴² No. 4 Squadron Pups were in the air again during the attempted London raid of 5 June in which Sheerness was in fact bombed. RNAS fighters made first contact with the approaching Gothas and chased them until forced by low fuel to land at Manston.¹⁴³ Three No. 4 Squadron Pups and seven No. 9 Squadron Pups and Triplanes intercepted the returning Gotha flight, damaging some, although failing to destroy any.¹⁴⁴ When London was next raided on 13 June the RNAS flew 30 sorties from the east coast stations, 32% of total home defence sorties flown, but again, the bombers escaped largely unscathed.¹⁴⁵

The steady response of the RNAS and the home defence fighters to the daylight Gotha raids prompted a change of target, and on 4 July Harwich and Felixstowe were raided by 18 Gothas. The raiders faced 85 RFC home defence sorties to no effect, while the Camels from RNAS No. 4 squadron (Dunkirk) encountered the returning Gothas north-west of Ostend and fought six combats, inflicting some damage on the fleeing bombers.¹⁴⁶

The London raid of 7 July by 24 Gothas was one of the most significant of the war, and again the RNAS put up its share of defence: 28 sorties representing 26% of the total home defence response were flown from Manston, Dover and other stations, 16 sorties were flown from RNAS Manston alone with pilots landing and refueling for the out-bound chase.¹⁴⁷ One

¹⁴⁰ Cole and Cheesman, *Air Defence of Britain*, pp. 201-3. Jones, *WIA*, vol. V, p. 14.

¹⁴¹ Cole and Cheesman, *Air Defence of Britain*, pp. 201-3, 238, 250.

¹⁴² *Ibid*, pp. 237-8.

¹⁴³ *Ibid*, p. 240.

¹⁴⁴ Jones, *WIA*, vol. V, p. 25.

¹⁴⁵ Fredette, *The First Battle of Britain*, p. 61.

¹⁴⁶ Cole and Cheesman, *The Air Defence of Britain*, p. 259.

¹⁴⁷ *Ibid*, p. 270.

Gotha was shot down by pilots from Dunkirk during the resulting long North Sea chase, and several more were damaged, one burned, when they crash landed at the Ghent aerodrome.¹⁴⁸

The audacity of the daylight raids against London produced public outcry and renewed calls for a concrete government response.¹⁴⁹ This public pressure on the fragile coalition government resulted in the appointment of Lieutenant-General Jan Smuts' small committee on air defence measures. He immediately produced what is known to history as the first Smuts report,¹⁵⁰ circulated only four days after the 7 July raid. In addition to recommending the appointment of a singular LADA commander (implemented in the form of Brigadier-General Ashmore),¹⁵¹ the report also concluded that, although uniformity of command, new tactics, and improved communications should be stressed, for the time being the successful RNAS coastal squadrons 'should continue to operate under separate Naval Commands'.¹⁵²

Smuts completed the second half of his report and circulated it on 17 August and unequivocally concluded in favour of the creation of an Air Ministry with the objective of unifying the RFC and RNAS.¹⁵³ DGMA Henderson had long supported this measure, arguing that the need for unity of service in the face of the Gothas was imperative considering that the individual piloting methods which had been used by the RFC home defences against the Zeppelins to date had been insufficient to break up the enemy's bombing formations.¹⁵⁴

Ultimately the decision to merge the RFC and RNAS was done for political reasons,¹⁵⁵ pioneered by a select group of air power advocates within the Army, Navy and civilian administrations. Although this decision would have a profound impact on the future of imperial defence, it also heralded the demise of the RNAS as a strictly naval organisation. Despite the political decision to form the RAF, the success of the RNAS coastal defence against the daylight

¹⁴⁸ Fredette, *The First Battle of Britain*, pp. 78-9. Jones, *WIA*, vol. V, pp. 37-8.

¹⁴⁹ White, *Zeppelin Nights*, p. 214.

¹⁵⁰ War Cabinet Committee on Air Organisation and Home Defence Against Air-Raids, First Report, 11 July 1917, CAB 24/20/53. Also, Appendix VI, Home Defence, in Jones, *WIA*, vol. V, p. 487. See, Luck, 'The Smuts Report', p. 153.

¹⁵¹ Fredette, *The First Battle of Britain*, p. 89. E. B. Ashmore, *Air Defence* (London: Longmans, Green and Co. Ltd., 1929).

¹⁵² Home Defence. Report of Lieutenant-General J. C. Smut's Committee, July 1917, in Jones, *WIA*, vol. V, Appendix VI, pp. 488-9.

¹⁵³ Air Organisation, Second Report of the Prime Minister's Committee on Air Organisation and Home Defence against Air Raids, 17 August 1917, Appendix II, in Jones, *WIA*, Appendices, pp. 8, 13.

¹⁵⁴ Memorandum on the Organisation of the Air Services, Lieutenant-General Sir David Henderson, July 1917, Appendix I in Jones *WIA*, Appendices, p. 1.

¹⁵⁵ Sweetman, 'The Smuts Report of 1917'.

raids was so pronounced that General Smuts, in a report produced on 6 September 1917 in response to the first night bomber attacks, recognized that ‘...the raiders have not been able to penetrate the line of our coast defences by day.’¹⁵⁶ Improvements made to London’s defences combined with an increase in RFC assets devoted to home defence successfully deflected the Gothas, whose pilots were more intent on attacking naval facilities and bases during August.

The first bomber night raid was conducted on the evening of 4 September by nine Gothas, dropping bombs on London, Dover and Margate. Although one Gotha was destroyed, probably by anti-aircraft fire, no interceptions were made.¹⁵⁷ The impact of the bombing raids on industrial production, particularly if bombs were to land amongst the ammunition storage at Woolwich, combined with general popular resentment at the apparent inability of the home defence forces to stop the night attacks, prompted the War Cabinet to focus on retaliation. Smuts was immediately tasked with reviewing the situation and in his report two days later recommended a counter-offensive against the enemy’s aerodromes as the best solution.¹⁵⁸ Smuts was keen to report that action had already been taken, specifically in terms of the formation of the 41st Wing RFC for bombing targets in Germany (see Chapter Five).¹⁵⁹ The transition to night raids in September was a critical event for the RNAS. The Gothas and the new Giant (Zeppelin-Staaken) bombers were difficult to locate and attack while in the air and, due to the perceived danger of flying over water at night, the RNAS, with Dunkirk playing a pronounced role, transitioned to providing counter-air defence by bombing the enemy’s aerodromes at source.

On the night of 24 September 13 Gothas bombed targets around the east coast of England, including three bombers that managed to reach London. Ten Zeppelins simultaneously attacked the Norfolk region.¹⁶⁰ These raids were met with only limited resistance. Another Gotha raid was made the night of 25 September, three bombers reaching London, followed by the first combined Gotha and Giant raids against England on the nights of 28 (during which Kagohl I - a Gotha squadron - bombed Dunkirk),¹⁶¹ and 29 September. Another 11 Gothas made for London again on the night of the 30 September, followed by 18 Gothas targeting London the night of 1

¹⁵⁶ Lieutenant-General Jan Smuts, Night Raids on London, 6 September 1917, Appendix VII in Jones, *WIA*, vol. V, pp. 491-3.

¹⁵⁷ Jones, *WIA*, vol. V, pp. 62-4. Cole and Cheesman, *The Air Defence of Britain*, pp. 324-5.

¹⁵⁸ Lieutenant-General Jan Smuts, Night Air Raids on London, 6 September 1917, Appendix VII in Jones, *WIA*, vol. V, pp. 491-3.

¹⁵⁹ Jones, *WIA*, vol. V, pp. 86-90. White, *Zeppelin Nights*, pp. 214-19.

¹⁶⁰ Jones, *WIA*, vol. V, pp. 78-82.

¹⁶¹ Fredette, *First Battle of Britain*, p. 140.

October. The monitor HMS *Marshal Ney* claimed to have shot down a Gotha near Ramsgate the night of the 28th, but this was the only success the Navy could claim.¹⁶²

Statistics collated by Cole and Cheesman show no RNAS sorties against the bombers attacking England during the 1 October raid. However, simultaneous to the London raid, 22 Gothas from Kagohl I (Hauptmann Alfred Keller) had attacked Dunkirk where they dropped ten tons of bombs on various targets around the air station and successfully destroyed 23 RNAS aircraft on the ground.¹⁶³ This example is of particular importance when it is observed that only 12 bombers actually made attacks again England that night.¹⁶⁴ Thus, what would at first appear to be a failure of RNAS coastal interception is recast as a significant diversion of enemy force away from England.¹⁶⁵ This is even more important considering that the 19 RFC fighters sent up to intercept the raiders failed to make any attacks, and that the London anti-aircraft guns themselves were short on shells and many were worn out from the week of incessant action.¹⁶⁶

Indeed, if *combats* are examined rather than the number of sorties, the picture of relative effort is somewhat different. RNAS interception of the 22 August Gotha raid was particularly significant as the combination of anti-aircraft gunfire and naval fighters from NAS Manston, Dover and Walmer were responsible for downing three enemy bombers, ultimately forcing the German raiders to transition to night attacks.¹⁶⁷ The 22 August raid is a good example of the manner in which statistics can tell a misleading story: the RNAS sortied only 17 aircraft as compared to the 121 fighters sent up by the RFC, but it was the former which accounted for the successful interceptions.

Furthermore, RNAS squadrons that could have been deployed from Dover for air defence, such as No. 9 (Sopwith Pups) and No. 10 (Sopwith Triplanes),¹⁶⁸ had been loaned to the Army in June and May 1917, and were not returned to Dover until 29 September and 20 November, respectively.¹⁶⁹ To fill the gaps in its defence force the RNAS attempted innovative

¹⁶² Jones, *WIA*, vol. V, p. 83.

¹⁶³ Jones, *WIA*, vol. IV, pp. 99-100.

¹⁶⁴ Fredette, *First Battle of Britain*, p. 146. Cole and Cheesman, *Air Defence of Britain*, p. 342.

¹⁶⁵ Cole and Cheesman, *Air Defence of Britain*, pp. 342-3.

¹⁶⁶ Morris, *German Air Raids on Britain*, p. 243. Fredette, *First Battle of Britain*, pp. 144-7.

¹⁶⁷ Trevor Henshaw, *The Sky Their Battlefield II: Air Fighting and Air Casualties of the Great War*, 2nd ed. (High Barnet: Fetubi Books, 2014), p. 263. Cole and Cheesman, *Air Defence of Britain*, pp. 288-300. Morris, *German Air Raids on Britain*, p. 231. Sutherland and Canwell, *Battle of Britain 1917*, chapter 6, loc. 1712-47. Fredette, *First Battle of Britain*, pp. 107-9.

¹⁶⁸ Westrop, *A History of No.10 Squadron*, p. 11.

¹⁶⁹ Bacon, *Dover Patrol*, vol. II, p. 249.

measures such as when Handley Page bombers from No. 7A squadron, after December No. 14 squadron RNAS stationed at Coudekerque, conducted a combined bombing and air patrol mission, and successfully intercepted Gothas returning from England on the morning of 30 September. One of the Handley Page aircraft was able to damage a Gotha and the enemy bomber subsequently crashed near the border with Holland.¹⁷⁰

On 19 October the Zeppelins launched an 11-ship raid against targets in the Sheffield, Manchester and Liverpool areas, and were met by 11 RNAS and 67 RFC sorties. Five Zeppelins were lost due to weather in what amounted to a fiasco,¹⁷¹ and as a result this was the last Zeppelin raid until March the following year.¹⁷² Another Gotha raid was carried out on the night of 31 October with London as the target, however in the event the bombs were dropped on Dover, Ramsgate, Margate and other cities and towns, so that only ten of the 22 Gothas reached London.¹⁷³ London was raided again on 5 December, and again on 18 and 22 December, the last raid of the year for 1917.¹⁷⁴ Although the RFC flew many sorties on these occasions, the RNAS, outside of Dunkirk, remained grounded.¹⁷⁵

After the September attacks, with the weather deteriorating, the priority for Germany had shifted back to the Western Front. The BEF offensive at Third Ypres was soon checked and, combined with the defeat of the Italians at Caporetto and the Bolshevik revolution in Russia, the initiative passed to Germany. The Gotha bombers, responding to the changing military situation, conducted raids only sporadically during the winter of 1917, with targets other than London predominating. Hauptmann Rudolf Kleine, commanding Kagohl III, was now ordered to cease attacks against England, and redirect his forces to support Hauptmann Keller's (Kagohl I) raids against Dunkirk.¹⁷⁶ The situation for the RNAS was also changing. American reinforcements arriving in France would soon relieve some of the pressure on the RNAS squadrons at Dunkirk.¹⁷⁷ Lastly, the drive towards the formation of the third service culminated in the formation of the Air Ministry in January 1918, the RAF following not long afterwards in April.

¹⁷⁰ Cole and Cheesman, *Air Defence of Britain*, p. 338.

¹⁷¹ Storey, *The Zeppelin Blitz*, Chapter three, 1917, loc. 4931. Cole and Cheesman, *Air Defence of Britain*, p. 345. Robinson, *The Zeppelin in Combat*, p. 303.

¹⁷² Jones, *WIA*, vol. V, pp. 92-102. Storey, *The Zeppelin Blitz*, 3, pp. 289-303.

¹⁷³ Cole and Cheesman, *Air Defence of Britain*, p. 353.

¹⁷⁴ *Ibid*, pp. 355, 357, 362.

¹⁷⁵ *Ibid*, p. 361.

¹⁷⁶ Fredette, *First Battle of Britain*, p. 131.

¹⁷⁷ Rossano and Wildenberg, *Striking the Hornets' Nest*, p. 170.

Vice-Admiral Sir Roger Keyes left the naval staff's Plans Division to replace Dover's Vice-Admiral Reginald Bacon on New Year's Day 1918. Within three days of assuming command he submitted a request for information from the Fifth Sea Lord, the Air Ministry, and Wing Captain Lambe, regarding the material requirements at Dover and Dunkirk. In addition to the various reconnaissance, A/S and airship assets requested, all parties agreed that at least three squadrons of fighters were needed for air defence at Dunkirk.¹⁷⁸ On 10 January Wing Captain Lambe submitted his requirements to Keyes but made no specific mention of fighter aircraft, focusing instead almost entirely on A/S equipment, a recognition of the importance of ASW for the RNAS at the beginning of 1918 (see Chapter Four).¹⁷⁹

The Gothas transitioned to the Western Front after the London raid of 28 January 1918, leaving the remaining Zeppelins and Giant bombers to carry on the air war over England. Night bombing of London was purely a psychological operation, Dunkirk, meanwhile, had become 'a funnel through which the British were pouring troops, ammunition, and supplies... [and] had become as important a target as London.'¹⁸⁰ The RNAS mission was thus shifting from the air defence of Britain to protecting the Channel ports from tactical attacks.

Although the Zeppelins continued to attack in small formations, they posed no real threat to England's defences. Wing Commander Samson, who had been placed in charge of RNAS Great Yarmouth after his tour in the Mediterranean (see Chapters Three and Four), included orders to the flying boats under his command to the extent that they should endeavor to intercept Zeppelins returning from raids. Samson considered air defence and anti-Zeppelin functions the second and fourth priorities of his command, behind only protection of merchant shipping duties and general air reconnaissance, respectively.¹⁸¹ Yarmouth and Felixstowe, important naval air stations in the ASW campaign that had indeed several Zeppelin victories, including downing Zeppelins *L22* and *L43*.¹⁸²

¹⁷⁸ Captain C. Fuller, Director of Plans, 14 January 1918, coversheet to VA Dover requirements for Dover, AIR 1/662/17/122/671.

¹⁷⁹ Wing Captain Lambe to VA Dover Patrol, 10 January 1918, AIR 1/662.

¹⁸⁰ Fredette, *First Battle of Britain*, p. 131.

¹⁸¹ Samson, *Fights and Flights*, p. 356.

¹⁸² RNAS Yarmouth to C-in-C Lowestoft, Report on destruction of Zeppelin *L22*, 14 May 1917, AIR 1/637/17/122/153. Harper, 'The Development of the Flying Boat', pp. 362-3. Robinson, *Zeppelin in Combat*, pp. 259-60. Hobbs, *Royal Navy's Air Service*, pp. 392-3. Appendix I, German Airships, in Jones, *WIA*, vol. III. Marder, *FDSF*, vol. IV, pp. 16-7. Popham, *Into Wind*, p. 57. Kemp, *Fleet Air Arm*, p. 62.

Decline: Naval Air Defence in 1918, and After the Creation of the RAF

The final raids of 1918 were carried out primarily by the Giant bombers, as the Gothas had been transferred to the Western Front to assist in Germany's spring offensive. A desperate Zeppelin raid on the night of 12 April was met by 11 sorties from the former RNAS stations, and Zeppelin L62 was chased out to sea (on 10 May that same Zeppelin was shot down by an F2A flying boat piloted by Captains T. C. Pattison and A. H. Munday).¹⁸³ A final all-out airplane raid against London was conducted on 19 May by 38 Gothas and three Giants, but the limited results of this raid spelled out the impracticality of continuing with the bombing of Britain.¹⁸⁴

The formation of the RAF on 1 April significantly impacted resources that had hitherto been allocated to the RNAS. The Air Ministry was primarily concerned with two forms of operations: namely, supporting the BEF on the Western Front and providing for the eventual long-range bombing of Germany. The result was that many of the naval squadrons were transferred to Field Marshal Haig, or to Major-General Trenchard's IAF (see Chapter Five). Vice-Admiral Keyes, SNO Dover-Dunkirk, was able as of 1 April to retain only a single RAF Wing, the 61st composed of five naval squadrons, while the 64th Wing (four naval squadrons) and 65th Wing (five naval squadrons) were both transferred to the BEF.¹⁸⁵ Keyes, recognizing the critical situation at the front, authorized further the transfer of his best fighters, Nos. 201 and 210 Squadrons, to Haig's command.¹⁸⁶ The RFC and Army Council thinking about air power had come to predominate, leaving only one third of the former RNAS resources for ASW, U-boat base bombing, fleet operations, and, significantly, air defence.

The RAF intention to support the BEF was, however, not entirely unreasonable during the period immediately following the creation of the third service. Following the initiation of Ludendorff's spring offensive on 21 March the situation in France had changed dramatically, and Dunkirk soon became a frontline town. By 27 March Wing Captain Lambe and his French and American counterparts were seriously considering the possibility of withdrawing from Dunkirk altogether.¹⁸⁷ Thus the formation of the RAF occurred at a time of acute crisis, when the BEF required as much support as it was possible to provide.

¹⁸³ Cole and Cheesman, *Air Defence of Britain*, p. 410.

¹⁸⁴ Ibid, p. 423.

¹⁸⁵ Jones, *WIA*, vol. VI, p. 382. Sturtivant and Page, *Royal Navy Aircraft Serials and Units*, pp. 432-5.

¹⁸⁶ Jones, *WIA*, vol. VI, p. 383.

¹⁸⁷ Rossano, *Stalking the U-Boat*, p. 64.

Although Keyes received back No. 204 Squadron with its Pups and Camels on 21 April,¹⁸⁸ the former RNAS forces at Dunkirk had been whittled down to almost nothing. The American Northern Bombing Group was rapidly expanding but the objectives of this force were, as the name implies, focused on long-range bombing, primarily of submarine bases, and not air defence.¹⁸⁹ Furthermore, the rapid expansion of the American aviation forces was beset with technical and training problems, meaning the USN would not be able to fill the gap left by the departure of the experienced naval squadrons until late in 1918, or more likely, 1919.¹⁹⁰ Dunkirk's role as a critical hub in the air defence network thus never truly recovered from the creation of the RAF. Indeed, by the end of May the situation had changed so much that the Air Ministry felt able to dispatch No. 38 (FE2bs) home defence Squadron to Keyes who, after the Zeebrugge and Ostend raids, was entirely committed to General Lambe's agenda of bombing the enemy's submarine bases.¹⁹¹ On the evening of 6 June the Germans retaliated by bombing the Coudekerque and Teteghem aerodromes and several hangers and nine fighters were destroyed. Keyes was forced to request an additional fighter squadron from the Admiralty, but he was reminded that the Air Ministry was now responsible, and that they were not likely to fulfil his request.¹⁹²

The situation as it concerned naval air defence late in the war was expressed to the Air Ministry by the former RNAS group commanders in a survey proposed by the Air Ministry on 9 September and carried out between then and 22 November.¹⁹³ Colonel Samson, RAF, in command of No. 4 Group and representing the RAF for the Harwich command, stated that attempts to standardize machines should be avoided, as doing so invariably produced aircraft ill-suited for specialized tasks. In Samson's list of 18 duties air defence received prominent attention, with roles ranging from anti-Zeppelin operations, air defence of patrolling ships, to the protection of merchant shipping from air and submarine attack.¹⁹⁴ Samson emphasized that he would require a multitude of specialized aircraft, and that a one-size-fits-all approach from the

¹⁸⁸ Jones, *WIA*, vol. VI, p. 384fn.

¹⁸⁹ William Sims, *The Victory at Sea* (Annapolis: Naval Institute Press, 2016), p. 331.

¹⁹⁰ Rossano and Wildenberg, *Striking the Hornets' Nest*, pp. 90-2.

¹⁹¹ Jones, *WIA*, vol. VI, p. 391.

¹⁹² *Ibid*, p. 394.

¹⁹³ Admiralty Letter No. M.023435 of 9 September 1918, extracts from replies thereto received from Commanders-in-Chief, Flag Officers and R.A.F. Authorities, and Admiralty Minutes on the same, ADM 1/8540, #271 in Roskill, *Documents*, pp. 715-33.

¹⁹⁴ Colonel Samson (No. 4 Group) to SNO Shotley, Operations which could be carried out by aircraft in Harwich Command in 1920, 14 September 1918, ADM 1/8540/258.

Air Ministry would not be satisfactory. Colonel Hugh Williamson, commanding RAF No. 18 Group, East Coast of Scotland, likewise observed that naval air defence would continue as a responsibility of the 'Marine Operation Groups' of the RAF, which he differentiated from strictly home defence forces in the tradition of the Balfour administration's division of responsibilities.¹⁹⁵ Admiral Sturdee, since March 1918 the C-in-C the Nore, recognized the need for at least two squadrons of fighting airplanes, one for air defence and another for offensive air patrol.¹⁹⁶ Brigadier-General Lambe recognized the need for 'fighting scouts'.¹⁹⁷

In short, all the Royal Navy and former RNAS commanders who were queried concurred that a variety of specialized air and seaplanes would be required for air defence in the foreseeable future, and that defensive fighting machines would play a role in almost every district or command. The continuity of roles is striking: the RAF, little concerned with ASW, protection of merchant shipping, or coastal defence, were unaware of how significant the RNAS missions actually were.

As the war in the west came to a close, the final air raid by Germany's naval airships took place. *L62* was destroyed off Heligoland on 10 May, *L54* and *L60* were destroyed in the Tondern raid on 19 July, and then *L70* was shot down off Wells-next-the-Sea, Norfolk on 5 August 1918. Lastly, *L53* was destroyed off Terschelling on 11 November 1918.¹⁹⁸ Flying boats and aircraft from RNAS Great Yarmouth destroyed five Zeppelins during the war.¹⁹⁹ Of these, four were shot down by RNAS pilots Leckie and Cadbury, a demonstration of the importance of experience and naval training in the anti-Zeppelin role.²⁰⁰

The loss of the last two Zeppelins is worth recounting as it concludes the Zeppelin story during the First World War. The final Zeppelin raid on England took place on the night of 5 August and was intercepted by Major Cadbury RAF, flying from Great Yarmouth in a DH4. Major Cadbury encountered and destroyed Zeppelin *L70*, not only Germany's latest Zeppelin, but then also carrying Fregattenkapitan Peter Strasser, the celebrated architect of the Zeppelin fleet.²⁰¹ Strasser's demise was a final reversal from which the Zeppelin force could not recover.

¹⁹⁵ Colonel Williamson (No. 18 Group) to VA East Coast of Scotland, 22 September 1918, ADM 1/8540/258.

¹⁹⁶ C-in-C the Nore to the Secretary of the Admiralty, 30 September 1918, ADM 1/8540/258.

¹⁹⁷ Brigadier-General Lambe (No. 5 Group) to VA Dover Patrol, 21 September 1918, ADM 1/8540/258.

¹⁹⁸ Appendix I: German Naval Airships, 1912-1918, Jones, *WIA*, vol. III.

¹⁹⁹ Samson, *Fights and Flights*, p. 357.

²⁰⁰ *Ibid.*, p. 357.

²⁰¹ Jones, *WIA*, vol. V, pp. 131-3. Cole and Cheesman, *Air Defence of Britain*, pp. 436-46. Morris, *German Air Raids on Britain*, pp. 196-8.

Six days later, on the morning of 11 August, Lt. Culley, in his Sopwith Camel, took off from a lighter towed by the destroyer HMS *Redoubt* and destroyed *L53*.²⁰² The Zeppelins had been comprehensively defeated, in no small measure by the RNAS and its RAF successor.

In purely monetary terms the total German bombing effort against Britain inflicted approximately £2.96 million in property damage over four years of conflict. This was the equivalent of one Queen Elizabeth class super-dreadnought, or slightly more than seven new light cruisers.²⁰³ The impact of the bombing raids was however more than just material, and the psychological and propaganda impact, from British and German sources alike, profoundly influenced the political and social situation at the home front, including the future development of industrial warfare. The RNAS had played a role during every stage of the air defence campaign, one that is rarely recognized amidst a historiography that focuses too often exclusively on the RFC and RAF.

Conclusion

Under Churchill's centralizing drive the Air Department had perhaps been over-ambitious when assuming responsibility for Britain's air defence in September 1914. However with the RFC completely deployed to the continent there simply was no alternative. The best efforts of Churchill and Sueter succeeded in that they provided the basis for an air defence system that continued to evolve during the remainder of the war. Balfour's refocus on coastal defence recognized that home defence, composed primarily of anti-aircraft guns and land fighters, were best left to the Army and RFC. The RNAS, despite the transfer of responsibility in February 1916, remained the frontline of air defence, however, as the RFC home defence squadrons generally consisted of second rate squadrons, the RNAS coastal defences were therefore more likely to achieve intercepts and produce real results in the anti-Zeppelin campaign.

The RNAS contribution after February 1916 was primarily in terms of coastal defence, a role that did double duty both in terms of the all-important A/S patrol, but also as a method of locating and attacking Zeppelin raiders. The Navy was correct to focus on coastal interception as the primary objective after February 1916, as this was in fact the most likely point at which to

²⁰² Herris and Pearson, *Aircraft of World War I*, p. 93. Hobbs, *Royal Navy's Air Service*, pp. 400-1.

²⁰³ Cole and Cheesman, *Air Defence of Britain*, p. 449. Grove, 'Seamen or Airmen?', p. 9. Table 16, Characteristics of British Battleships, 1889-1913, in Jon Tetsuro Sumida, *In Defence of Naval Supremacy: Finance, Technology, and British Naval Policy, 1889-1914* (Annapolis: Naval Institute Press, 1993).

intercept returning attackers. Signals intelligence enabled advance notice of incoming airship raids, making it possible to intercept attacking Zeppelins *en route*. With new ammunition, aircraft, and night-flying methods introduced during 1916, the RNAS was able to intercept several Zeppelins and was thus well prepared for the daylight Gotha raids of 1917. Although the night raids of late 1917 changed the dynamic, the RNAS continued to play an important role intercepting Zeppelins and diverting German bombers away from England to RNAS Dunkirk, increasingly the centre of the air battle in 1918.

RNAS home defence has been overlooked due to the formation of the RAF and the historiography of the 'First Battle of Britain' that has decontextualized the significant contribution of the RNAS to defeating both the Zeppelins and Gothas. From the perspective of the Navy's traditional role as the first-line of defence against invasion, the RNAS took up the mantle of fighting Zeppelin and airplane attacks against England. It was remarkably successful in this role and by late 1917 had contributed to the defeat of both the Zeppelin and Gotha raids. Air defence naturally formed one of the pillars of the RNAS mission, from bombing Zeppelin bases at source to conducting interceptions over England and the North Sea, to reducing Gotha formations during their return flights, to bombing the Gotha aerodromes at source, the RNAS provided the best chance of combating the raiders. The RFC home defence forces and LADA had both evolved from the Air Department's pioneering efforts under Sueter and Churchill, foreshadowing Fighter Command's role in the Second World War.

Chapter Seven: Conclusion

The potential of the groundwork that had been laid by the RNAS during the First World War was demonstrated on 6 September 1919 when 11 Sopwith Cuckoos of RAF No. 186, Torpedo Development Squadron, Gosport (formed 1 January 1919 aboard HMS *Argus* as the successor to No. 185 Squadron that was disbanded on 14 April 1919), simulated an aerial torpedo attack against the Atlantic and Home Fleet's Second Battle Squadron while it was stationary off Portland Harbour.¹ Eight Cuckoos were armed with torpedoes, the remaining three aircraft being equipped with smoke bombs. The attack took place in two waves. The first flight of five torpedo-bombers and two smoke aircraft approached their targets overland from the north and scored two hits on HMS *Implacable* as well as single hits on both HMS *Barham* and HMS *Malaya*.² With this strike underway the second flight attacked undetected from the south and struck the flagship HMS *Queen Elizabeth* twice with their dummy torpedoes. Between these two waves only two torpedoes failed to score hits, those having struck the shallow seabed. The Atlantic and Home Fleet C-in-C, Admiral Sir Charles Madden, was impressed writing in his appraisal of the results of this exercise that the torpedo-plane was now 'the most dangerous form of torpedo attack upon heavy ships.'³ This striking success reflected the culmination of wartime learning and technological development, a clear demonstration of the maturity of the RNAS harbour attack proposals that had been percolating since 1915.

The September exercise was also the end of an era, a final glint of light in the long shadow of post-war demobilization. Less than a month before, on 15 August 1919, Prime Minister David Lloyd George had announced a plan to drastically reduce the cost of the armed forces. This 'Ten Year Rule' effectively heralded the end of the wartime naval aviation force and, by April 1920 the former RNAS force had been reduced to not much more than a single squadron.⁴ The whole-of-service unity that had been fostered by the pre-war RFC, was honed and expanded by the wartime RNAS, had completely collapsed. 54 former RNAS squadrons were disbanded in 1919 as the RAF was reduced from 200 wartime squadrons to 25, with all 74

¹ Hobbs, *The Royal Navy's Air Service*, pp. 472-5. Newman, 'Pioneering Torpedo Training at East Fortune' p. 151.

² Burns, *The RNAS and the Birth of the Aircraft Carrier*, Chapter 17 Wilhelmshaven, loc. 4274.

³ Till, *Air Power*, p. 143.

⁴ Goulter, *A Forgotten Offensive*, p. 37.

former RNAS squadrons, except No. 216, completely disbanded by 1923.⁵ The demise of the Naval Wing was thus a bitter pill for the Royal Navy to swallow the Admiralty having spent almost a decade developing naval aviation to a high degree of excellence, tightly integrated with the navy's force structure and supported by a robust administrative apparatus, only to watch on the sidelines as the entire force was consumed and then forgotten by the Air Ministry.

The budgetary bleakness of the interwar years was not, however, immediately apparent amidst the celebration of the war's conclusion on 11 November 1918. Indeed, Britain's first wartime experience with naval aviation, although by no means a smooth path, had generally been a stunning success. In each of the roles examined in this thesis the RNAS had overcome major shortcoming to demonstrate rapid technological innovation, adaptation, operational learning, and theoretical development. The path forward had often been rocky, dotted with wartime losses, administrative upheavals, and inter-service rivalry, yet by 1 April 1918, the RNAS' practitioners had not only developed the full range of naval aviation capabilities but also demonstrated fundamental aspects of what would become the basis of the RAF's airpower doctrine. The RNAS had pioneered long-range bombing before it was appreciated by the RFC, and played an essential role in the defence of Britain from both Zeppelin and Gotha attack. RNAS air raids, launched from land bases and from aircraft carriers, demonstrated airpower's reach, attacking targets far behind the enemy's frontlines. Reconnaissance and gunfire spotting missions impacted the war at sea and quickly became a standard component of amphibious operations. The RNAS had played a crucial role in the A/S campaign, developing an immense coastal patrol system that the RAF adopted upon its formation. RNAS squadrons, it should not be forgotten, had even deployed with the RFC in France and Belgium, while former naval squadrons formed an important element in the IAF. Many of the former RNAS practitioners who had developed naval aviation during the war would go on play significant roles with the RAF after 1939.

As the September 1919 exercise demonstrated aviation, like all of the 20th century technologies that preceded it, had been successfully developed as a naval weapon and, although the RNAS officers at the end of the First World War now belonged to the RAF, it was clear that a close relationship with the post-war Navy was essential. RAF Brigadier-General Oliver Swann, formerly Captain Schwann, RNAS, wartime commander of HMS *Campania*, argued as much in

⁵ Popham, *Into Wind*, p. 84. Lewis, *Squadron Histories*, pp. 68-88. Sturtivant and Page, *Royal Navy Aircraft Serials and Units, 1911-1919*, pp. 432-40. Till, *Air Power and the Royal Navy*, p. 30.

a 1919 article in the *Naval Review*.⁶ Conducting naval warfare without aircraft, in all of its myriad aspects, was now unthinkable.

The Impact of Naval Administration and Government Policy on the RNAS

The administrative context structured how the RNAS practitioners approached the development of naval aviation between 1914-1918. This context can be described in three phases, framed generally by the changing administrations at the Admiralty and Air Department. The first phase began when First Lord of the Admiralty Winston Churchill formally created the RNAS on 1 July 1914. Although Churchill departed the Admiralty in May 1915, the influence of the Churchill period did not come to a close until February 1916. It was then that the Royal Navy's responsibility for the air defence of Britain was returned to the Army, ending a policy Churchill had maintained since his September 1914 arrangement with War Minister Lord Kitchener. This period was dominated by the dynamic personalities of Churchill and DAD Commodore Murray Sueter.

Much has been said about Churchill's influence on naval aviation development. This thesis has demonstrated that Churchill's administration was ultimately a mixed blessing. His drive and energy certainly contributed to the rising status of the naval aviators as a class of their own, technically proficient, daring, and possessing an *esprit de corps* well suited to the pioneers of a cutting edge combined arms force. Churchill's ambitious agenda and centralizing drive was, however, brought to an uncontrollable boiling point when his thrusting personality was teamed with the volcanic character of Admiral Sir John Fisher, the First Sea Lord. Churchill and Fisher's tendency to use the Air Department as a technological think-tank, combined with operational overreach, pushed the RNAS to its administrative and operational limits.

Churchill's role as a champion of naval aviation led him to commit to policies that decisively impacted the development of the Naval Wing, not always for the better. Churchill was a mercurial advocate of Captain Reginald Bacon's airship program, with the unfortunate result that the First Lord's enthusiasm for rigid airships cooled after the 'Mayfly' disaster of 1911. Although work could have been redoubled following this catastrophe, rigid airships were instead relegated to the back-burner. The long-term impact of this disaster was thus to handicap Britain's

⁶ Oliver Swann, 'Naval Air Requirements' in *NRJ*, vol. 7, no. 3, 1919, pp. 305-13. See also, Grove, 'The Naval Aviation Controversy, 1919-1939', pp. 113-6.

rigid airship program for the entire war. Had the Admiralty, and Churchill in particular, shown a greater willingness to accept this setback and overcome it, Germany's Zeppelin advantage would perhaps not have been as pronounced early in the war, and the Grand Fleet certainly would have been better equipped to provide aerial reconnaissance for the fleet, a missing element that Admirals Jellicoe and Beatty never tired of describing.

Another key decision by Churchill was the assumption of responsibility for the air defence of Britain. This policy, while it suited Churchill's aggrandizing temperament, burdened DAD Sueter with immense responsibility at precisely the time his administrative powers were being stretched to the limit by the requirements of the war. Resources expended developing Britain's air defence could have been directed towards tailoring the RNAS role with the fleet, or focused instead on the Dardanelles campaign. This policy decision forced Sueter to split his limited time on a task of purely local importance, as the Zeppelins were not going to win the war on their own. First Lord Balfour's reversal of this policy in February 1916 indicated that the Air Department had taken on more than it could realistically deliver.

Without Churchill and Sueter's initiative, on the other hand, Britain would have been totally unprepared for the Zeppelin offensive when it came. The first naval air stations were constructed under Churchill's watch, making it possible for the RNAS to patrol Britain's coasts. RNAS armoured cars and airplanes seemed to offer the Royal Navy a new means of conducting amphibious and expeditionary warfare, and Churchill was quick to capitalize on this unique capability against Germany's Zeppelin sheds and in support of amphibious operations at Antwerp, Ostend, Dunkirk and the Dardanelles. The RNAS was becoming a totally new kind of military organisation, driven more by Churchill's imagination than by immediate naval necessity.⁷

The aircraft, airships and equipment that would become standard components of the RNAS' inventory later in the war, from Handley Page bombers to Sea Scout blimps, were imagined, developed, and tested during Churchill's tenure. The Grand Fleet's primary aircraft carriers, *Campania* and *Engadine* were converted and worked up with the fleet, while the fundamentals of reconnaissance and gunfire spotting were both developed and then demonstrated at the Dardanelles and in German East Africa. Sueter worked tirelessly to solve technical problems handed to him by Churchill, ranging from the development of Britain's air defence to

⁷ Pugh, 'Conceptual Origins of the Control of the Air', p. 345.

long-range bombers, to the invention of the tank.⁸ The RNAS during this period was indeed land-oriented, conducting armoured car operations in Belgium, defending British territory from Zeppelin attack, raiding Germany's Zeppelin sheds, and supporting ground operations at Gallipoli.

Churchill's dismissal as a result of the May Crisis set the stage for the second phase of the administrative history of the RNAS. Although Balfour had taken several important measures prior to 1916, it was his policy shift in February 1916 that truly marked the conclusion of the Churchill period. Balfour's naval-focused RNAS policy can then be said to have lasted until Jellicoe's addition of the Fifth Sea Lord position to the Admiralty Board, as part of his reforms in January 1917. Although Balfour's tenure as First Lord began in May 1915, he initially maintained many of Churchill's policies. Balfour began to deviate from Churchill's policy when he took the key decision to integrate the RNAS further within the Navy on 29 July 1915,⁹ and then in September, decided to replace Sueter with Rear-Admiral Vaughan-Lee. By the beginning of 1916 it was clear that Balfour would pursue a different policy, facing new challenges such as the accelerated Zeppelin and submarine campaigns and including the threat from a reinvigorated High Seas Fleet, restless for action. The RNAS was reoriented as a maritime organisation, assuming the role of a first line of defence for Britain's coasts. Technical innovation during this period was less spectacular but more fundamental. Lessons learned at the Dardanelles and Dunkirk were applied to the fleet, strengthening aerial close air support, gunfire spotting and reconnaissance missions. Improvements to aircraft W/T sets, bombsights, anti-Zeppelin incendiary ammunition, and a vastly expanded training regime, greatly increased the overall effectiveness of the RNAS.

Although Balfour's policy of decentralization heralded the end of the RNAS' freewheeling Churchill-Sueter-Samson days, it thus also laid the groundwork for the regional system of control that Jellicoe was to organize in 1917. The RNAS, from Balfour's perspective, had to swim before it could fly – support the Navy first, primarily at sea. The new model was thus less the Royal Marines and more the Submarine Service, with a notable exception: No. 3 Wing and its long-range bombing mission. The creation and demise of Wing Captain Elder's No. 3 Wing, the prototype for the strategic bombing missions of the future, had a profound impact on

⁸ Higham, *The British Rigid Airship*, p. 94.

⁹ Admiralty Weekly Order No. 1204/15, 29 July 1915, ADM 1/8408, #72 in Roskill, *Documents*, pp. 212-13.

the conduct of the air war. The introduction of long-range bombing against German industry showcased the new technologies and foreshadowed a core component of air power yet to come. Yet, like the 'Mayfly' disaster, the disbanding of No. 3 Wing proved a watershed decision that fundamentally transformed the scope of naval aviation's responsibilities. The result was a delay in the development of a retaliatory capacity at exactly the moment when the Gothas started to bomb Britain on the home front. Control of long-range bombing passed to the Army, ironically only four months after the dismantling of No. 3 Wing.

David Lloyd George's ascension to the Prime Ministership in December 1916 heralded the end of the Balfour-Jackson period. Admiral John Jellicoe's appointment as First Sea Lord then became the defining event that shaped the administration of the RNAS until the formation of the Air Ministry in January 1918.¹⁰ ASW was Jellicoe's top priority and the RNAS was relentlessly refocused on this aspect of the naval war. Jellicoe's Naval Staff reforms tightly integrated the RNAS into the structure of the navy, and the appointment of Fifth Sea Lord Godfrey Paine at the outset of 1917 finally put naval aviation on a level playing field with the Army Council (however, by picking a pro-RFC administrator such as Commodore Paine, Jellicoe had perhaps unknowingly reopened the door leading to unification that had been closed with Sueter's departure). The creation of the regional RNAS groups during 1917 became the basis for the RAF system of home defence following April 1918, while the best technical officers in the RNAS were given the resources to implement revolutionary systems that would ultimately contribute to winning the war against the U-boats.

With Jellicoe at the Admiralty the Grand Fleet became the responsibility of Admiral Sir David Beatty, whose strong desire to bring the High Seas Fleet to action resulted in the creation of the Grand Fleet's Flying Squadron, with Rear-Admiral Richard Phillimore appointed as ACA at the end of 1917. Commodore Sueter, who had been sidelined as SAC, went to work alongside Thomas Sopwith and others to devise a torpedo-bomber capable of carrier operations while aircraft launching equipment was added to every capital ship in the fleet. The Zeppelin menace was soundly defeated and, by September 1917, the RNAS had also contributed significantly to the defeat of the menacing daylight Gotha raids essentially ending the threat of mass bombing against England, although nuisance night raids by Staaken bombers continued. Jellicoe's creation of the Air Division of the Naval Staff in December 1917 ensured that the naval aviators would

¹⁰ Pulsipher, 'Aircraft and the Royal Navy', p. 361.

continue to be represented while operational learning to date was codified and disseminated, despite the loss of the Air Department to the Air Ministry. It was this system, implemented by Jellicoe's successor Admiral Rosslyn Wemyss, that carried the RNAS wings and squadrons (former wings and squadrons after 1 April 1918) through to the conclusion of the war.

The final point to address is thus the decision by the Prime Minister to create the Air Ministry and the RAF. This subject remains controversial to this day, and begs the counter-factual scenario wherein the war proceeded without a unified air force. Certainly the RNAS had become thoroughly integrated into the Navy by the end of 1917, so much so that the formation of the RAF initially did not disrupt affairs despite the new leadership at the Air Ministry. The machine, so to speak, was finely tuned and could run on its own, at least for a little while. The negative results of this decision were ultimately felt after the war, when the Army dominated RAF proceeded to dismantle the former RNAS squadrons.

The changing political and service priorities during the war thus profoundly impacted the development of Britain's naval aviation, shaping the structure within which the practitioners carried out their developmental work. Furthermore, the path forward for the service administrators, and the RNAS practitioners, was frequently constrained by the exigencies of the war itself. Within this bounded structure the RNAS practitioners had to demonstrate agency and initiative in the implementation of policy that, often as not, required inventing entirely new equipment and procedures. The naval aviators needed champions who could forward their cause as much as the navy needed technical and operational specialists.

A significant lesson from the administrative aspect of naval aviation's development was the long-term impact of choices made under unclear circumstances. The watersheds discussed above, covering the core RNAS roles during the war, have traditionally been decontextualized as a result of the fragmented nature of the literature. The policy decisions were, however, closely connected and each administrative decision influenced the next, resulting in a form of technological path dependency. The RNAS has been criticized for lacking a clear doctrinal foundation, with the result that deviations from the supposedly natural role of naval aviation with the fleet were frequent.¹¹ This argument does not recognize that the core naval aviation roles had in fact been established before the war and what with hindsight seem like unnecessary deviations were actually cutting edge applications of airpower to naval operations. It is true that the precise

¹¹ Roskill, *Documents*, pp. xvi-ii, 453.

focus of naval aviation development transitioned over the course of the war as each administration grappled with different challenges, or placed its emphasis on different priorities. Deviations were usually in response to new wartime conditions, demonstrating adaptability by the RNAS, rather than exemplifying failed doctrine.

Ultimately the wartime RNAS had to contend with four different Admiralty First Lords, five First Sea Lords, three separate Air Department heads, the complete re-organisation of the Naval Staff under Jellicoe, and then the final abolition of the Air Department all together. The frequent changes in administrative personnel meant that the continuity of policy from month to month was a real concern, and complete reversals of commitment were not uncommon during the war. Immense pressure was placed on the service practitioners and staff officers to produce doctrinal and operational continuity between changing administrative priorities and to respond to the service's needs in wartime.

The Practitioners and their Contribution to Naval Aviation's Development

If doctrine is to be discussed it should be observed that the best results were obtained when there was synergy of purpose between the RNAS practitioners and the Royal Navy's officers and administrators. In the case of Britain's air defence, the A/S campaign, and the development of naval aviation with the fleet, for example, when the district SNOs and fleet commanders could rely on their naval aviation contingents they achieved historic progress. Likewise, the RNAS commanders needed champions on the naval side who could advance their requests for material and assist in the development of operational planning. Without formal representation on the naval staff until 1918 harmony, or at least the absence of antagonism, between the district SNOs and fleet commanders was essential for naval aviation's development. By placing RNAS personnel directly on their staffs the SNOs could at least partially remediate the development of intra-service disconnects, but only if the RNAS practitioners could trust that their Royal Navy counterparts had their best interests in mind.

Vice-Admiral Reginald Bacon's multi-year divergence of opinion with Wing Captain Charles Lambe is a significant example of a situation where such a disconnect existed. While Lambe believed firmly in the utility of long-range bombing, Bacon preferred to commit his RNAS assets to support the Dover barrage in addition to developing aerial gunfire spotting techniques. The problem was resolved when Vice-Admiral Roger Keyes replaced Bacon, Keyes

and Lambe forming an effective partnership. Happier examples are provided by Admiral Alexander Bethell, the SNO Plymouth, who worked closely with the RNAS South West Group CO, Wing Captain Eugene Gerrard, to develop the 'spider web' A/S patrols on the western approaches. Nearby, Rear-Admiral Stanley Colville, SNO Portsmouth, worked with the RNAS Channel Group CO, Wing Commander A. W. Bigsworth, to suppress the U-boat threat. In the distant environs of Queenstown, Ireland, Vice-Admiral Lewis Bayly, although initially skeptical of the usefulness of RNAS support, later developed a cooperative relationship with the USN's aviation chief, Captain Hutch Cone.

First Lord Balfour's distaste for Churchill's irregular methods meant the demise of Commodore Sueter, who had done so much to engineer and lead the early Naval Wing and RNAS. Sueter's replacement by Vaughan-Lee meant the end of Churchill's military-branch policy and an increasing antagonism with the War Office over air defence and long-range bombing. Unity of purpose within a changing wartime framework, with administrators coming and going amidst a flurry of technical innovations, would test the limits of any pre-war doctrinal establishment, let alone a completely new form of warfare emerging from the chrysalis.

Many officers, whose names appear and re-appear in these chapters, contributed to different aspects of naval aviation's development. Certain practitioners stand out for their diverse contributions that crossed the thematic demarcations used to frame the chapters of this thesis. Commodore Sueter, for example, played an early role in the development of rigid airships, then established Britain's anti-aircraft defences, and later worked to develop torpedo equipped aircraft for the fleet. Sueter's Air Committee report of 29 August 1912 essentially prophesized how naval aviation should develop during the war. Like Colonel Frederick Sykes, who was an enormously important figure in the development of pre-war RFC doctrine and training (not to mention an early practitioner of close air support at the Dardanelles and of strategic bombing as CAS), Sueter's contribution to Captain Paine's Naval Wing portion of the joint RFC training manual should not be forgotten.¹² Likewise, DAS Vaughan-Lee deserves credit for his work on the RNAS armament manual, an important document in terms of naval aviation's role as the frontline of Britain's air and coastal defence. Rear-Admiral Frederick Tudor, the Third and then the Second Sea Lord, contributed to the development of air defence and anti-Zeppelin armaments, and was also involved in planning the never executed Wilhelmshaven strike. Tudor,

¹² Pugh, 'Oil and Water', pp. 131, 135-6.

however, had opposed the development of fleet carriers, a policy his successor as Third Sea Lord, Rear-Admiral Lionel Halsey, was keen to reverse. At the tactical level, Wing Commander Samson may have started off as an experimental pilot at Eastchurch, but his role steadily evolved, ranging from armoured car operations to seaplane carrier command, ultimately leading to RAF regional command in the A/S and air defence roles.

Squadron Commander Hugh Williamson's contributions also crossed the spectrum of naval aviation roles, from aircraft carrier development, gunfire spotting, to submarine hunting and even operational research.¹³ Squadron Commander Arthur Longmore, after establishing the all-important continental station at RNAS Dunkirk, found himself commanding a gun turret aboard HMS *Tiger* at the Battle of Jutland, before flying off to the Mediterranean to help Sueter prepare anti-U-boat measures.¹⁴ Flight Commander F. W. Bowhill (later Air Chief Marshall Bowhill) and Squadron Commander L'Estrange Malone, both commanders of North Sea seaplane carriers, were responsible for operationalizing the earliest naval air strikes, supported by pilots and observers such as Flight Commander F. E. T. Hewlett and Lieutenant Erskine Childers, who collectively proved that (given favourable weather conditions) aircraft could act offensively with the fleet. Flight Commanders C. H. K. Edmonds and G. B. Dacre put the seaplane into action as a torpedo carrier at the Dardanelles, and later contributed to gunfire spotting missions with the EIESS.

Later in the war ACA Phillimore's SFO, Lieutenant-Colonel Richard Bell Davies, and his chief of staff, Colonel Robert Clark-Hall, planned and executed the famous Tondern Raid of July 1918, demonstrating how far the technique of naval air strike had been advanced by the RNAS. It should not be forgotten that it was Major Cadbury, formerly Flight Lieutenant RNAS, who destroyed *L70* and the Zeppelin force commander, Peter Strasser, along with it. Not often mentioned is the number of practitioners who came from the Submarine Service or had pre-war torpedo specialization. This group included Bacon, Sueter, Porte, Williamson, and Longmore amongst others. With careers spanning so many aspects of the naval and air war the only way to address the contribution of these pioneers is with a holistic approach. Simply isolating one aspect is the historiographical equivalent of missing the forest for the trees.

¹³ Haslop, *Early Naval Air Power*, pp. 105-6.

¹⁴ Longmore, *From Sea to Sky*, pp. 45-77.

This is not to denigrate the contribution of more specialized practitioners, however. As chairman of the GFAC, Rear-Admiral Hugh Evan-Thomas provided the fleet with a clear articulation of its air roles, although his involvement with naval aviation ended at that point. Likewise, Rear-Admiral Phillimore's GFAO's provided the Flying Squadron with its written responsibilities, although he cannot be said to have prepared naval aviation doctrine proper. Lt. Commander de Courcy Ireland pioneered the theory of aerial attack on ships in harbour in December 1915, a concept so far ahead of its time that Samson was scratching away at a similar proposal three years later. Ireland's death, alongside Wing Commander Usborne, meant the end of a promising aviation career and a serious blow to the developmental side of the RNAS. Third Sea Lord Lionel Halsey, alongside Captain Herbert Richmond, deserve credit for promoting the naval air strike plan for Wilhelmshaven, if their role in the development of naval aviation is otherwise circumscribed. Squadron Commander Edwin Dunning gave his life testing experimental landing techniques that resulted in the development of safer carrier operations.

Rear-Admiral Horace Hood pioneered air reconnaissance during his operations along the Belgian coast and demonstrated the potential of gunfire spotting, an essential element of the naval bombardment deployed at the Dardanelles the following year, but Hood's death at Jutland meant no further role in RNAS history. Vice-Admiral Sackville Carden, who devised a method of gunfire spotting from scratch prior to the Dardanelles campaign, was so shortly thereafter replaced by Rear-Admiral John de Robeck that the full extent of his contribution has not generally been recognized. Commander Robert Clark-Hall operationalized Carden's gunfire spotting theory aboard HMS *Ark Royal* at the opening of the bombardment, meanwhile, Squadron Commander Cull demonstrated the viability of similar methods against the *Königsberg* - independent achievements that testify to the soundness of the RNAS' unwritten doctrine.

The well known case of Flight Commander F. J. Rutland's historic seaplane reconnaissance at Jutland proved that aircraft could operate with the fleet in a major engagement, albeit in a limited capacity.¹⁵ Less well known is Squadron Commander I. T. Courtney's contribution to the Deck Landing Committee of November 1917 that paved the way for the integration of aircraft into the battle fleet. The efforts of Wing Commanders Edward Maitland and Neville Usborne towards the development of non-rigid airships paid dividends in the A/S campaign, as did Squadron Commander Theodore Hallam's work on the 'spider web' patrols.

¹⁵ Keegan, *Price of Admiralty*, pp. 184.

Squadron Commander Reggie Marix both executed a prototypical long-range bombing mission against Germany's Zeppelin sheds and then contributed to the training of pilots for Wing Captain Elder's No. 3 Wing. Elder, for his part, had demonstrated his capacity for material development and staff work as Inspecting Captain of Aircraft before pioneering No. 3 Wing's long-range bombing mission. Rear-Admiral Phillimore's development of the Flying Squadron from his flagship HMS *Furious* would not have been possible without the foresight of Grand Fleet C-in-C Admiral Sir David Beatty, who likewise deserves credit for convening the GFAC and advancing ASW.

Training, good staff work, and the publication of literature became more essential as the war progressed, and here especially the contribution of the RNAS practitioners is evident. Captain Godfrey Paine oversaw the training of the entire RFC from inception until he was appointed to RNAS Cranwell. Furthermore, as the first Fifth Sea Lord before taking his seat on the Air Council, Paine shouldered the burden for training and educating the first generation of naval aviators, in particular supporting Jellicoe's A/S agenda. In a narrower capacity, Captain G. W. Vivian produced one of the earliest lectures on aerial ASW while he was commanding HMS *Hermes* in 1913, another example of multi-thematic practice. Lieutenant-Commander Richard C. M. Pink, who prepared the operation reports for Sueter in 1915, although almost totally unknown today, is significant for having started the collection of material that would make possible operational research when Williamson became head of the Air Section of the ASD. Captain A. V. Vyvyan, another significant staff officer working behind the scenes at the Air Department, provided a critical and continuous policy-link throughout the changing Air Department administrations. Vyvyan was an engine of work, organising material and drafting schemes ranging from anti-Zeppelin operations to long-range bombing.

Other unsung heroes of the maritime war were the regional SNOs, often the driving force behind not only aerial ASW but also Britain's air and coastal defence. District officers such as Rear-Admiral George Ballard, Rear-Admiral Stuart Nicholson, Admiral of the Fleet Sir George Callaghan, Admiral Sir Alexander Bethell, Rear-Admiral Stanley Colville, Vice-Admiral Cecil Burney and of course Commodore Reginald Tyrwhitt (not to mention Bacon and Lambe) should feature prominently in any history of the RNAS and its contribution to the naval-air war. Rear-Admiral George Hope of the Operations Division also deserves credit for proposing to Jellicoe that an Air Division of the staff should be established, and Brigadier-Generals Scarlett and

Groves, who went on to lead that Air Division, were far more influential than history has thus far recorded, their contributions ranging from organising naval air stations to systematizing training manuals and advancing hydrophone technology.

The myriad contributions of these naval aviation practitioners demonstrated that, in terms of the historiography of the RNAS, and Britain's naval aviation development during the First World War in general, it is no longer enough to simply cite the well worn cases of Churchill, Sueter, Tudor, Sykes, Samson, Rutland, Longmore and Williamson.¹⁶ The modern researcher must move beyond the fragmentation of the specialized literature and commit to a broader prosopography, examining the RNAS and its personalities in a holistic fashion.

Technical Innovation and Material Limitations

While the administrators established and changed priorities it remained for the RNAS practitioners, working with Britain's aviation industry, to design and develop solutions that could fill the operational requirements. The impact of the RNAS on aviation technical development has been well recognized.¹⁷ Despite the best efforts of the practitioners, however, certain strategic decisions sometimes simply outpaced the technology altogether. Examples include the RNAS attempting to find a means to attack Zeppelins without any incendiary bullets, or when No. 3 Wing was established prior to the delivery of its heavy bombers. After the declaration of the War Zone around Britain, First Sea Lord Fisher, who had been quick to realize the importance of aircraft for ASW, tasked Wing Commander Osborne with developing a technical response to the submarine threat, realized as the experimental Sea Scout blimps – an entirely new concept that had to be engineered from prefabricated components. Grand Fleet C-in-C Beatty's plan to strike Wilhelmshaven in 1917 required devising torpedo carrying airplanes, while the need to intercept high-flying Zeppelins and bombers resulted in the development of triplane interceptors, capable of reaching altitude quickly.

Technical specialists who could navigate between the Naval Staff and the civilian firms, speeding development of key systems or introducing novel technological solutions, were thus invaluable as were experienced and courageous pilots to test new (and often dangerous)

¹⁶ Roskill, *Documents*, pp. xiii-xvii. Abbatiello, 'Doctrinal Innovation in the Royal Naval Air Service', pp. 35-45. Pugh, 'Oil and Water', pp. 132-38. Pugh, 'The Conceptual Origins of the Control of the Air', pp. 302-8.

¹⁷ Goulter, 'Royal Naval Air Service', pp. 51-65.

equipment. Technical setbacks and personnel losses could halt entire programs. The deaths of Wing Commander Usborne, Lt. Commander Ireland, Squadron Commander Dunning, and Flight Lieutenant Warneford all testify to the unmatched daring that defined the RNAS in the face of seemingly insurmountable challenges, but also the thread-bare nature of war in the air more than a century ago. As Prince Andrew, the Duke of York, wrote in 1997 in his foreword to Brad King's *Royal Naval Air Service* 'knowledge could only be gained through trial, error and in some tragic cases death.'¹⁸ Talent and experience lost with each casualty simply could not be easily replaced.

The RNAS practitioners always seemed to be playing catch-up. The emphasis that constantly evolving technical requirements put on single firms and small design teams, or even individual designers, seems almost rash with hindsight. Lieutenant C. D. Burney's work on Fisher's pre-war A/S committee never got the attention it deserved, nor did Williamson's early work on aircraft carriers. Admiral Percy Scott's jury-rigged anti-aircraft solutions were unlikely to deter determined Zeppelin raiders. Wing Captain Scarlett's advocacy for hydrophone development, a system ultimately attached to coastal monitoring stations, destroyers and other A/S vessels, aircraft and airships, paved the way for the important ASDIC of the future. The technology was so primitive even in 1918, however, that it could not be described as a comprehensive A/S measure. Commander Williamson's Blackburn Kangaroo became the most successful A/S aircraft of the war, but only in 1918 when the submarine crisis had largely receded. The Navy would have been hard-pressed to fight the war in the air without RNAS Warrant Officer F. W. Scarff's ring for Lewis guns, or his Scarff-Dibovsky machine gun interrupter gear.¹⁹ Likewise, the question of how the RNAS would have engaged in ASW in 1917 without Squadron Commander J. C. Porte and his flying boat designs is a serious reminder of the importance of cultivating robust talent in terms of technical innovation.

In 1915 there were simply not enough Sea Scout blimps available for A/S patrol, and the Grand Fleet never received the rigid airships it desperately required for fleet work. Only a single seaplane carrier could be provided for the entire force at the Dardanelles bombardment, a situation repeated at Jutland. Aircraft engines were in such short supply that they had to be purchased from France and the United States. Low quality incendiary ammunition let more than

¹⁸ King, *Royal Naval Air Service*, p. 7.

¹⁹ Jones, *WIA*, vol. II, pp. 163-4.

one Zeppelin escape what should have been certain destruction. Outstanding leadership and technical wizardry could almost overcome material limitations, but even the best practitioners could not turn water into wine.

Conceptualizations of Naval Aviation During the First World War

The core question this thesis addressed was that of the development of naval aviation in Britain, and how naval aviation was appreciated and shaped by the Royal Navy's practitioners and service administrators. The preceding chapters have developed the argument that the RNAS was profoundly influenced by the directives and theories of the naval and civilian leadership at the Admiralty and amongst the Air Department. The airplane and airship transformed the conduct of war on land and at sea, foremost by enabling the attack of military and industrial targets behind the frontlines, or indeed on the home front itself. Naval aviation also presented fleet commanders with new possibilities for attack and defence, including the potential to counter the introduction of the submarine, the latter responsible for so thoroughly upsetting the traditional dominance of the battleship in naval affairs.

For Winston Churchill, as First Lord of the Admiralty, and Commodore Murray Sueter, as the Director of the Air Department, aviation was a novel element of naval power, combining traditional naval functions, such as coastal reconnaissance and defence from invasion, with the offensive possibilities that seemed to mirror late 19th century thinking in the French Navy's *jeune école*, and their Young Turk British counterparts.²⁰ Comparatively inexpensive weapons systems could perhaps be employed to upset established traditions and the naval service's white elephants.²¹ Aircraft and airships could strike naval targets in their defended harbours, offering the Royal Navy - or any military organisation that utilized them - the ability to extend traditional naval concepts such as blockade or coastal raids even as far as the enemy's cities.²² The navy's aircraft offered the only defence against such attacks perpetrated by the enemy, and the defensive uses of aircraft against Germany's Zeppelins and Gothas speaks to this vital role for Britain's naval aviation. That all of this was perceived before war broke out in 1914 may come as a surprise, but it was indeed the case.

²⁰ Padfield, 'The Submarine as Commerce Raider', pp. 95-8.

²¹ Arne Roksund, *The Jeune Ecole: The Strategy of the Weak* (Boston: Brill, 2007), pp. x-xi.

²² Marder, *FDSF*, vol. I, pp. 337-9.

The Royal Navy adopted aircraft and airships in a similar fashion to the other technical systems that had relentlessly transformed the navy's material foundations over the course of the 19th and early 20th centuries. From shell firing guns to steam power, iron armour to self-propelled torpedoes, electric power, W/T, and the submarine, aeronautics was viewed as the next step in a logical progression of innovation. Aerial warfare, however, also heralded a more fundamental revolution: the independent offensive in the air.

In the total war calculus of attrition and aerial bombing the RNAS offered the only means of countering Germany's Zeppelin raiders and the only reasonable means of retaliation (Sir John Fisher's other option, executing prisoners, was deemed unacceptable).²³ The promise of industrial bombing might even hasten the impact of the naval blockade. Germany's submarines soon found their freedom of action restricted by aircraft patrols, and submarine crews could not loiter on the surface without some degree of risk - except at night. Submarines caught on the surface by aircraft were exposed to immediate attack, and had to assume their position would be reported to nearby destroyers for further pursuit. Airships and airplanes, in their most significant role, also provided protection for Britain's merchant convoys, statistically guaranteeing the safety of convoys under aerial escort.

So revolutionary was naval aviation, in fact, that within the Royal Navy itself a number of practitioners, including Commodore Sueter, Admiral Mark Kerr, Commodore Paine, Captain Vyvyan, and others, became motive forces behind the ideas of the air power futurists in the Army and amongst the civilian leadership. The vision of these futurists was that a completely unified air force would eventually surpass the older services altogether. Without these key naval practitioners advocating for a return to a unified air service the RAF might never have been created. Whether these individuals were accurate in their beliefs is another matter, but what can be said is that through their advocacy for air unity and independence, war itself had been fundamentally transformed and any future conflict, at sea or otherwise, would undoubtedly require a significant number of aircraft, pilots, and their supportive bases and training infrastructure.

Historians have perhaps overstated the immediate impact of the formation of the RAF on naval affairs as the ongoing contribution of the former naval squadrons to long-range bombing, ASW, air defence and fleet work carried on essentially as before. Another significant point in

²³ Freeman, *Tempestuous Genius*, chapter 23, loc. 4948-64.

this regard is the inverse: the impact of the RNAS on the RAF, which has been almost totally ignored considering the confrontational inter-service rivalry that emerged almost immediately after the war. Yet it was the RNAS which undeniably pioneered industrial bombing and developed Britain's first air defence network, both core aspects of the RAF's mission after 1919.

The fundamental error in the formation of the RAF was the assumption that a unified air service could do whatever the RFC and RNAS had done before. Although the former RNAS officers and personnel maintained their service duties in the final months of the war, the tightening budgets and post-war rivalry put the naval aviators at a great disadvantage with no recourse elsewhere if their post-war requirements were not met. For the Royal Navy, the RAF's control of naval aviation became an albatross that threatened to dramatically weaken Britain's maritime defence, thus establishing the roots of a conflict that has persisted to the present day.

The tragedy in the history of the RNAS is thus its final demise. After the wartime struggle to build capability, the Navy's airplanes, stations and officers (other than its airships) were all lost to the RAF. The long-term negative impact this decision would have on the interwar development of naval aviation in Britain is now well established.²⁴ Whatever savings were prophesied to occur through the unity of the air under a single service were offset by the need to finance three separate military organisations with shrivelled post-war budgets.²⁵ But none of this was known to be the fate of Britain's naval aviation in 1914, or indeed in the fall of 1918. That certain RNAS wartime roles have been perceived as aberrations, or of purely experimental value, is to misjudge the Navy's interest in aerial warfare, as well as the interrelated nature of air defence and offensive.²⁶ Aircraft, although they may have entered naval service as uncertain reconnaissance auxiliaries, quickly evolved into an entirely new form of warfare. In short, Britain's naval aviation development impacted every aspect of the war at sea and beyond.

²⁴ Till, *Air Power and the Royal Navy*, p. 189.

²⁵ Cumming, *Battle for Britain*, Chapter 10, loc. 3490.

²⁶ Pulsipher, 'Aircraft and the Royal Navy', pp. 356-9.

Bibliography

Primary Source List¹

National Archives, Kew

- | | |
|-----------------|--|
| AIR 1 | Air Historical Branch Papers |
| /58/15/9/62 | - Lambe to CO 61 Wing, 15 June 1917. |
| /95/15/9/263 | - Lambe to C. F. Kilnor CO No. 82 wing, 14 August 1918. |
| /111 | - Wing Commander R. B. Davies, No. 3 Wing Oberndorf raid pilot reports, 12 October 1916. |
| /111/15/39/1 | - Operations from Luxeuil and Ochey – details of air raids over enemy territory, July 1916. |
| /115 | - W. Graham Greene to CO No. 3 Wing, 27 July 1916.
- Secretary of Admiralty to CO RNAS No. 3 Wing, 19 October 1916.
- Wing Captain Elder, 24 May 1917. |
| /148 | - Director Air Services Rear Admiral Vaughan-Lee, Defence of Air Stations from Aircraft Attacks, 4 February 1916.
- Rear-Admiral Vaughan-Lee, Proposed Operations to Deter Hostile Airships from Raiding England, 6 March 1916.
- Admiral G. A. Callaghan, Nore Special order. 1387 –Recognition Signals for Friendly Aircraft at Night.
- Director Air Services to CO RNAS Calshot, 9 March 1916. |
| /167 | - Report by Lieutenant F. W. Bowhill, Commanding HMS <i>Empress</i> , on the Raid on Cuxhaven on Christmas Day 1914. |
| /273 | - Start of Air Division files.
- Director Air Division, Supply to those actively engaged in anti-submarine operations with intelligence relating to types, performance and probably tactics of enemy submarines, 8 March 1918, AD35.
- Director Air Services, Supply to those actively engaged in anti-submarine operations with intelligence relating to types, performance and probably tactics of enemy submarines, 14 April 1918, AD35, ASD8619.
- Air Division, RNAS, F. E. Boats landing at Malta, re. inspection and acceptance of 5 March 1918, AD22.
- F. R. Scarlett, DAD, Seaplane Station, Alexandria, 6 March 1918, AD37.
- The British C.in.C. Mediterranean Seaplane Base at Alexandria, 9 March 1918, AD37.
- Lt. Col. Norman Leslie to Director Air Organisation, No. 64 Wing has been activated, 28 May 1918, AD 37.
- Lt. Vernon W. Lamb, CO HMS <i>Orotava</i> , report of operations at Dakar, November 23 1918, AD49
- Director Air Division to C-in-C Plymouth, 1 October 1918, AD 49.
- Extracts of Information received from Air Stations of Operations by Royal Air Force Contingents from 13 th June to 16 th June 1918, Operations from Killingholme. |
| /274 | - Memorandum by Captain F. R. Scarlett, Director Air Division, Naval Staff, dated 18 March 1918 and undated Minute by Captain W. W. Fisher, Director Anti-Submarine Division. |
| /275 | - F. R. Scarlett note on C in C Nore, Hydrophone Experimental fitting of seaplanes, 25 - March 1918, AD369. |
| /279 | - Memorandum as to the functions of the Fifth Sea Lord and Director of Air Services', 14 January 1918. Signed by Admiralty secretary, O. Murray. |
| /279/15/226/127 | - Air Department. Organisation & Duties of Admiralty Concerning the Air Services. June 1917 – February 1918. |

¹ Note, primary sources and documents cited from Navy Records Society volumes have been excluded. Documents listed here are generally unpublished, although some are digitized and available online.

	- Memorandum as to the functions of the Fifth Sea Lord and Director of Air Services, June 1917.
	- Office Memorandum, 14 January 1918.
/279/15/226/133	- Air Department. Memorandum on the Use of Aircraft for the Protection of Shipping, with Charts, 30 March 1918.
/289/15/226/139	- Col H. A. Williamson, Aircraft on Convoy Escort, East Coast Command, 15 September 1918.
/291/15/226/140	- Rosyth Secret Memorandum No. 067/19, 15 February 1918.
/292	- End of Air Division Files
/296	- Extracts of Information received from Air Stations of Operations by Royal Air Force Contingents from 13 th June to 16 th June 1918. Operations from Dunkirk.
/463/15/312/137	- Reports and memorandum drawn up for consideration by Strategic Council, 17 January 1918.
/625/17/1	- Griffin, 'Some Rough Notes on the Early Development of the R.N.A.S., 1912-1917.
/626/17/46	- Appendix No. 1. Report of Captain of Hermes on Use of Aircraft During Manoeuvres. In W. H. May's Report, August 1913.
/626/17/59	- Air Division, 'Reports of Naval Air Operations'
/626/17/88	- Air Department, Aeroplanes for Naval Service, 1913.
/633	- RNAS Dunkirk Report on bombing raid by No. 5 Wing RNAS in Cooperation with RFC on Ghisteltes Aerodrome,' 3 – 20 September 1916
/633/17/122/87	- RNAS Dunkirk Report on bombing raid by No. 5 Wing RNAS in cooperation with Royal Flying Corps on Ghisteltes Aerodromes, 3 September 1916
/635/17/122/117	- Orders re Aircraft Patrols issued to Air Stations under Command of R. A. C. East Coast, 16 August 1916.
/637/17/122/153	- RNAS Yarmouth to C-in-C Lowestoft, Report on destruction of Zeppelin L22, 14 May 1917.
/638	- Commanding Officer Handley Page Squadron to Wing Captain Elder, raid night of 5-6 April 1917.
/640	- Orders and reports by Wing Captain Lambe while head of RNAS Dover-Dunkirk
	- Wing Captain Lambe to Commodore Dunkirk and Vice Admiral Dover Patrol, 31 October 1917.
/641	- Rear Admiral Commanding East Coast of England to Admiralty, No. 1634/W.548/14, 19 May 1917.
	- Director Operations Division, Rear-Admiral P. W. Hope minute to Vice-Admiral Bacon's cover-letter attached to Wing Captain Lambe's report on offensive operations at Dunkerque, 10 June 1917.
	- DOD Hope and DASD Fisher minute to Vice-Admiral Bacon's letter of 4 July 1917.
/641/17/122/223	- Rear Admiral East Coast, Suggested new scheme of aerial patrols on the East Coast, 18 May 1917.
/642	- R. M. Groves, Director Air Division, minute to: Hugh Williamson, Employment of Aeroplanes for Anti-Submarine Work. 26 August 1918, AD 3845.
/642/17/122/252	- Hugh Williamson, Employment of Aeroplanes for Anti-Submarine Work, 14 August 1918
/644/17/122/292	- SW Group Patrol Orders, 1 September 1917.
/648	- Rear-Admiral Hugh Evan-Thomas to Admiral Beatty, Air Requirements of the Grand Fleet, 5 February 1917.
	- Report of Committee on Royal Naval Air Service. (H.F.0036/212 of 26 th January 17).
	- Admiralty notes on Grand Fleet Air Committee Report. 3 March, 1917.
	- Rear-Admiral Vaughan-Lee to DNC, 11 May 1916.
	- Armstrong Naval Yard, High Walker, Newcastle-on-Tyne, to S. V. Goodall, Esquire, 27 February 1917.
/648/17/122/385	- Captain L. S. Stansfeld, The Royal Naval Volunteer Reserve Anti-Aircraft Corps, May 1919.
/656	- Henry Oliver to First Sea Lord, 15 December 1916
/659	- Commander Ireland's report to R. N. Air Station, Great Yarmouth, 20 December 1915.

- Memo by H. A. Williamson, 'Torpedo Attack on German Fleet by Aircraft Proposals by Sqdn. CDR. Ireland,' Ireland (RNAS CO, Great Yarmouth) to Vaughan-Lee (DAS), 29 December 1915.
- Flight Commander Brooke aboard HMS *Empress* to Officer Commanding East Indies & Egypt Seaplane Squadron, May 13, 1915.
- RNAS Portsmouth Group, General Report of Work Carried out during year 1917, 2 December 1917.
- /662 - Committee on Deck Landing, Preliminary Report, 17 December 1917.
- Wing Captain Lambe to VA Dover Patrol, 10 January 1918.
- /662/17/122/671 - Captain C. Fuller, Director of Plans, 14 January 1918, coversheet to VA Dover requirements for Dover.
- /672 - Orders and reports by Wing Captain Lambe while head of RNAS Dover-Dunkirk.
- Commodore Murray Sueter, Operations Order A.D. No. 15, Orders for Naval Air Service Units Based at Dunkirk, 21 June 1915.
- /675/21/13/1385 - J. C. Nerney, 'History of the Anti-Submarine Campaign, 1914-1917,'
- /677/21/13/1901 - Development and Operations of the Royal Naval Air Service in Home Waters, Fleet Co-operation, Pt. I, January 1917 to April 1918
- /677/21/13/1902 - Air Ministry, Air Historical Branch. The RNAS in Home Waters. January 1917 – April 1918, Part II: Submarine Campaign.
- /695 - No. 203 Squadron, Royal Air Force. (Formerly No.2 Squadron, R.N.A.S.)
- /725/106/1 - Wing Commander J. T. Cull, History of R.N.A.S. operations in East Africa, November 1914 to January 1917
- /785/204/558 - Sykes, Training Manual AP 144, Royal Flying Corps, Part II, Military Wing, 1915
- /824/204/5/71 - Admiralty Air Department, Training Manual Part II (Naval Wing), 1914
- /978/204/5/1139 - GHQ Directive, 3 June 1916.
- /2105 - RNAS Anti-Submarine Reports, June 1917 – March 1918
- /2107/207/42 - History of No. 3 Wing, RNAS, undated.
- /2115/207/56/1 - Report of the Aircraft Bombing Committee of Effects of Bombing in Belgium and Enemy Defensive Measures, March 1919.
- /2266 - Wing Captain Elder, summary of No. 3 Wing history, 24 May 1917.
- Wing Captain Elder, Appendix II, Summary of Raids Carried out by No. 3 Wing, RNAS, between 30th July and 14th April 1917.
- Notes on report of bombing operations of No. 3 Wing RNAS in France during winter 1916/1917.
- No. 3 Wing Operations in France, Admiralty War Staff (O.D.) March 1917
- /2301 - 10 June 1920, 'Some personal notes – 1914-1915, RNAS by Group Captain, E. L. Gerrard'
- /2319 - Minutes of the JWAC meeting, 6 March 1916.
- Churchill statement, War Council, Notes from a meeting held at 10 Downing St. on 1 Dec 1914.
- War Committee minutes, 10 February 1916.
- Machines Available, Naval, Joint War Air Committee, 29 February 1916.
- Policy of Army Council with Regard to Royal Flying Corps (Military Wing), JWAC, 2 March 1916.
- Table 2, Policy of the RNAS, Joint War Air Committee, March 1916.
- Joint War Air Committee, Interim Report, 20 March 1916.
- Director Air Services, Present Deficiencies and Future Requirements of the Royal Naval Air Service, Joint War Air Committee, 22 March 1916.
- Use of Explosive Bullets against Hostile Airships. Memorandum by the Chairman of the Air Board, 20 July 1916.
- /2321/223/41/885 - Notes on the Co-operation of Aircraft with Surface Craft for Escorting Convoys of Merchant Ships.
- /2440 - Director Air Department, Air Service Estimates, 22 January 1914.
- /2496 - Winston Churchill, Tactical Objects for which Naval Seaplanes are required, First Lord minute, 26 October 1913.

/2577	- Early Submissions made by Air Depart. To Obtain Suitable Seaplane Carrying Ships, 1915. - R. C. M. Pink to DAS, Royal Naval Air Service, Communiqué No. 3, 22 December 1915.
AIR 2	Air Ministry and Ministry of Defence files
/35	- Statement of policy and duties of the Royal Naval Air Service for production at the Joint War Air Committee, 28 February 1916.
/123	- Proposals for bombing of blast furnaces in France, Belgium and Alsace-Lorraine.
AIR 6	Air Board Minutes
/1	- Captain A. L. Ellison, R.N. statement at 24 May 1916 meeting of Air Board. - Commander Smyth Osbourne's statement at the Air Board meeting of 24 May 1916. - Minutes of the First Meeting of the Air Board, 22 May 1916.
/4	- Thirty Second Meeting of the Air Board, 3 January 1917.
AIR 27	Air Ministry, Operations Records
/1332/1	- Operation Record Book, No. 216 Squadron, RAF, Late No. 16 Squadron, RNAS, 1939.
AIR 10	Ministry of Defence and predecessors: Air Publications and Reports
/117	- Naval Air Service Training Manual, November 1914.
/179	- Wing Commander Sykes, Training Manual Royal Flying Corps, Part I, May 1914
/860	- Notes on the Co-operation of Aircraft with surface craft for Escorting Convoys of Merchant Ships, Air Division, Naval Staff, December 1918.
ADM 1	Admiralty Correspondence and Papers
/8408/7	- Director Air Department, Murray Sueter, Administrative changes and discipline of the Royal Naval Air Service, 5 January 1915. - Admiralty Weekly Orders, Naval Air Service – Re-organisation, M.0160/15, 27 January 1915. - Oliver Schwann, ADAD, Changes in Administration of the Naval Air Service: Report of Committee, 4 January 1915.
/8449	- Conclusion of the Second Meeting, held at 2 Whitehall Hardens, S. W., on Monday, February 28, 1916.
/8449/39A	- Policy of RNAS, Rear Admiral Vaughan-Lee, 1916. - Memorandum of Meeting Held in Second Sea Lord's Room, 21 March 1916. - Admiralty document on RNAS bombing, 25 February 1916. - Vaughan-Lee, Director Air Services to the Chief of Staff, Henry Oliver, 17 February 1916 - Vaughan-Lee minute on RNAS Establishment, 15 March 1916 - Vaughan-Lee to Henry Oliver, 4 April 1916
/8478/10	- RNAS Policy and Development, Paine reply, 30 January 1917 - Director Air Services Commodore Godfrey Paine to Admiralty, Royal Naval Air Service, - - Policy and Development, 21 January 1917.
/8486/82 1917.	- Flight Commander P. Holmes, report of patrol in H12 No. 8661, Felixstowe, 30 April 1917.
/8504	- Beatty's draft of the ACA functions, 29 December 1917
/8508/285	- G. Hope, Director Operations Division, Proposed Establishment of an Air Division, 19 December 1917.
/8525/136	- Colonel C. R. Samson, Suggested Aeroplane Offensive, 4 May 1918
/8540/258	- Colonel Samson (No. 4 Group) to SNO Shotley, Operations which could be carried out by aircraft in Harwich Command in 1920, 14 September 1918. - Colonel Williamson (No. 18 Group) to VA East Coast of Scotland, 22 September 1918. - C-in-C the Nore to the Secretary of the Admiralty, 30 September 1918. - Brigadier-General Lambe (No. 5 Group) to VA Dover Patrol, 21 September 1918.

- /8549/13 - Appreciation of British Naval Effort during the War.- Role of the R. N. A. S., 16 January 1919.
- /8550/28 - Future Distribution of Aircraft Carriers, 2 February 1919.
- ADM 53 Ship's logs
/34046 - Log of HMS *Argus*, 14 September 1918 to 31 January 1919.
- ADM 116 Admiralty Records, Cases
/1342 - Airships Instructions, Grand Fleet Battle Orders, 24 January 1917.
- Admiral Beatty, Grand Fleet Battle Orders, 22 July 1917 & 5 September 1917.
- Grand Fleet Battle Instructions', Instructions for Aircraft, 1 January 1918.
- ADM 137 Admiralty Records used for Official History
/401 - Admiral David Beatty, Grand Fleet Air Orders, 14 March 1918.
/876 - Grand Fleet, Reports of Proceedings, October – December 1917.
/877 - Grand Fleet, Reports of Proceedings, 1918.
/2008 - Orders and Memoranda issued by the Commander in Chief Grand Fleet for general Distribution, 1916 1st April to 30th June, Grand Fleet Battle Orders, 2 April 1916.
/2213 - Captain-in-Charge Lowestoft and Yarmouth to Admiralty, 28 April 1915.
- C-in-C Lowestoft to Admiralty, 20 February 1915.
- Commander H. C. Cherbrooke SNO Great Yarmouth to Captain-in-Charge Lowestoft, 18 August 1915.
- H.M. Naval Base, Great Yarmouth, reports, 29 January 1915.
- Lieutenant Colonel commanding 1/25 Cyclist Battalion to Captain-in-Charge Lowestoft, 25 September 1915.
- H. G. Sherbrooke C-in-C Yarmouth Naval Base to Lowestoft, forwarded to Director Admiralty Intelligence Division 18 October 1915.
- C-in-C Lowestoft to Commander, RNAS Great Yarmouth, 27 November 1915.
- C-in-C Lowestoft & Yarmouth to Admiralty, 20 February 1916.
- Lieutenant Commander HMS *Dryad* to C-in-C Lowestoft, 1 April 1916
- Flight Sub-Lieutenant F. Reeves to CO Air Stations Great Yarmouth, 26 April 1916.
- Flight Sub-Lieutenant G. W. Fane to CO Naval Air Station Great Yarmouth, 26 April 1916.
/2237 - Yarmouth & Lowestoft Base Records, 1914-1918, vol 1.
/2241 - Lieutenant Commander O. F. Murray, Harwich, to Admiral of Patrols, Immingham, 7 June 1915.
/2278 - Dunkirk, Commodores Records, No. 11.
- SNO Dunkirk to Sub-Chief General Staff, 27 October 1915.
/2710 - Plans Division: war records, Volume 5, Lambe to Keyes Report, 'The general effects of Offensive Operations carried out by Bomb-dropping in aircraft,' 3 February 1918.
/2715 - The structure of the Anti-Submarine Division, n.d. [January 1918].
/4055 - Grand Fleet Battle Instructions, January 1, 1918.
- Grand Fleet Battle Instructions, November 25 1918.
/4297 - Report of Fregatten-Kapitan Looff, 11 July 1915, p. 2. German Narrative of Events Leading up to the loss of the 'Koenigsberg',
- ADM 167 Admiralty Board Minutes
/47 - Admiralty Board Minutes, Wednesday 29th October 1913
/49 - Admiralty Board Minutes, 9 July 1915
- Admiralty Board Minute, 18 June 1915
- Admiralty Board Minutes, 10 September 1915
- Admiralty Board Minutes, 25 November 1915
/50 - Admiralty Board Minutes, Friday 4th February 1916
/51 - Admiralty Board Minutes, Wednesday 31 January 1917

ADM 186	Admiralty Publications
/66	- 'C.B. 973. Naval War Manual' Naval Staff, Training and Staff Duties Division, 1925 October
/165	- Director Air Services, Handbook of Aircraft Armament, July 1916, C.B. 1161.
/595	- Grand Fleet Battle Orders. Volume I. August 1914 to May 31 st , 1916' & 'Grand Fleet Battle Orders, Part VII. Sheets issued between Jan. 1916 and May 1916.'
/596	- Seaplane Carriers, Grand Fleet Battle Orders, 5 January 1917.
ADM 196	Officers' Service Records
/20/469	- Service record of Reginald H. S. Bacon
/42	- Service record of Mark Edward Frederic Kerr
/44	- Service record of Charles L. Lambe
/44/131	- Service record of Francis R. Scarlett
/87/95	- Service record of Reginald H. S. Bacon
/89	- Service record of Gerald W. Vivian
/125/33	- Service record of Francis R. Scarlett
/126/30	- Service record of Robert Hamilton Clark-Hall
/141	- Service record of Francis R. Scarlett
/143/234	- Service record of John Cyril Porte.
ADM 273	Royal Naval Air Service Registers
/2	- Service record of W. P. de Courcy Ireland.
	- Service record of William Leslie Elder.
	- Service record of Henry P. Smyth-Osbourne.
/2/17	- Service record of John Cyril Porte.
/2/40	- Service record of Robert Marsland Groves.
/31/26	- Service record of John Cyril Porte.
CAB 14	Cabinet Records, Committee of Imperial Defence
/1	- Air Committee Minutes, 1912-1914.
CAB 23	War Cabinet Minutes, 1917
/3/17	- Appendix, Cabinet Committee War Policy on Long-Distance Bombing Operations, War Cabinet 169, 26 June 1917.
	- Appendix I & II. Report on Long-Distance Bombing Operations War Cabinet 169, 20 & 22 June 1917.
/4/2	- War Cabinet Minutes 228, 5 September 1917.
/4/21	- Air Raids and Bombing of Germany, Minutes of a Meeting of the War Cabinet, 9 October 1917.
CAB 24	War Cabinet Minutes, 1916
/2/9	- Major-General Henderson, Duties of the Royal Naval Air Service and the Royal Flying Corps, 28 January 1916.
/20/53	- War Cabinet Committee on Air Organisation and Home Defence Against Air-Raids, First Report, 11 July 1917.
CAB 42	War Council & Successors, Copies of Minutes
/2/19	- Minutes of the War Council meeting, 14 May 1915.
/8/2	- Major-General Henderson, Duties of the Royal Naval Air Service and the Royal Flying Corps, 28 January 1916.
/8/5	- Duties of the Royal Naval Air Service and The Royal Flying Corps, War Committee Minutes, 10 February 1916.
	- Prime Minister's statement, War Committee minutes, 10 February 1916.

- Duties of the Royal Naval Air Service and The Royal Flying Corps, War Committee Minutes, 10 February 1916.
- /11/11 - List of Committees appointed to consider Questions arising during the Present War, 31 March 1916, CAB 42, p. 27.
- /15/16 - British Merchant Vessels Lost by Hostile Action, August 1914 – May 1916.
- /26/1 - Memorandum for the War Committee: Long-Range Bombing Operations by Aircraft, 9 November 1916.
- Rear Admiral Tudor's statement, Minutes of the One Hundred and Forty-First meeting of the War Committee, 28 November 1916.
- MUN 4 Ministry of Munitions Records
- /2424 - Specially Selected .303-inch ammunition for Royal Naval Air Service, 10 October 1916.

Churchill College, Cambridge

- DRBK 4/3 - Vice Admiral Commanding Eastern Squadron Mediterranean, Carden, Orders for forcing of the Dardanelles by the Allied Squadron, HMS *Queen Elizabeth*, 14 February 1915
- HOOD 5/1 - Important Signals Made and Received, 25 October 1914, Rear-Admiral Hood
- WLMN 1/1 - Aeroplanes for Naval Service, Hugh Williamson, March 1912
- 'The Aeroplane in Use Against Submarines' Group Captain Hugh Williamson Papers

National Maritime Museum, Greenwich

- BTY/7/3/4 - Selections from Grand Fleet Battle Instructions
- DEY/34 - The Flying Boat, draft article by Narbeth, 1 January 1924
- DEY/95 - DNC's Department, Admiralty, Aircraft Carriers, Part I: 1914 – 1918, January 1919
- VIV/7 - Vivian's list of the chief engineers in the Air Department, 1916
- VIV/8 - Captain G. W. Vivian, Précis of Lecture on 'SEA-PLANES', The Uses and Employment - of Sea-Planes in War. Royal Naval War College Portsmouth. December 1913.

Imperial War Museum, Archives

- CH4779 - Photograph of Winston Churchill learning to fly in a Short-Sommer Pusher Biplane, T2, Eastchurch, Kent, November 1913.

RAF Hendon, Museum Archives

- DC 74/102/39 - Arthur Longmore, Part I, RN and RAF 1911 to 1945
- DC 74/102/40 - Arthur Longmore, Part II, RN and RAF 1911 to 1945

Joint Services Command and Staff College Library, Archive

- Report on the Effects and Results of the Bombing of Germany by 8th Brigade and Independent Force, Royal Air Force: (D) Aerodromes
- Railways, Report of the Effects and Results of the Bombing of Germany By the 8th. Brigade and Independent Force, Royal Air Force,

House of Commons Records

- HC, vol. 19, cc. 1762-3 - Prime Minister H. H. Asquith statement on Aerial Navigation, 25 July 1910
- HC, vol. 50, cc. 1774 - Mr. Churchill's statement on Navy Estimates, 26 March 1913
- HC, vol. 73, cc. 1156 - Statement by Mr. King, 19 July 1915, & 22 July 1915
- HC, vol. 94, cc. 20-30 - Statement by Bonar Law, 5 June 1917

Flight Magazine

- Flight*, vol. 7. no. 36, 3 September 1915.
- Flight*, vol. 7. no. 50, 10 December 1915.

Air Power Review, Special Edition, Spring 2013

- Sykes minute to David Lloyd George, 1 June 1918.

Major General Trenchard to Lord Weir, Air Minister, 1 January 1919.

London Times

‘The Queen And The Benin Expedition,’ 2 March 1897, *London Times*, p. 5.

‘Need For Shells,’ 14 May 1915, *London Times*, p. 8.

‘Shells and the Great Battle,’ 14 May 1915, *London Times*, p. 9.

Daily Mail

‘Loss of British Battleship,’ 14 May 1915, *Daily Mail*, p. 5.

Secondary Sources

Unpublished Theses

- Abbatiello, John J. 'British Naval Aviation and the Anti-Submarine Campaign, 1917-1918.' PhD thesis, King's College London, 2004.
- Gloystein, John W. 'Mahan, Corbett, and Economy of Force in the Command of Sea and Air.' MA Thesis, Air University, School of Advanced Air and Space Studies, 2007.
- Gray, Peter W. 'The Strategic Leadership and Direction of the Royal Air Force Strategic Offensive Against Germany from inception to 1945'. PhD thesis, University of Birmingham, 2009.
- Jones, Ben. 'Ashore, Afloat and Airborne: The Logistics of British Naval Airpower, 1914-1945.' PhD thesis, King's College London, 2007.
- McCartney, Innes. 'The Maritime Archaeology of a Modern Conflict: Comparing the Archaeology of German Submarine Wrecks to the Historical Text, Volume One.' PhD thesis, Bournemouth University, 2013.
- Pugh, James. 'The Conceptual Origins of the Control of the Air: British Military and Naval Aviation, 1911-1918.' PhD thesis, University of Birmingham, 2012.
- Pulsipher, Lewis E. 'Aircraft and the Royal Navy, 1908-1918.' PhD thesis, Duke University, 1981.
- Robbins, Guy. 'The Evolution of the Aircraft Carrier, 1914-1916.' PhD thesis, University of London, 1992.
- Streckfuss, James. 'Eyes All Over the Sky: The Significance of Aerial Reconnaissance in the First World War.' Ph.D, University of Cincinnati, 2011.

Books & Edited Volumes

- Abbatiello, John J. *Anti-Submarine Warfare in World War I: British Naval Aviation and the Defeat of the U-Boats*. New York: Routledge, 2006.
- Abbott, Patrick. *The British Airship at War, 1914-1918*. Lavenham: Terence Dalton Ltd., 1989.
- Adlam, Henry. *The Disastrous Fall and Triumphant Rise of the Fleet Air Arm from 1912-1945 (Ebook)*. Kindle ebook. Barnsley: Pen & Sword Aviation, 2014.
- Air Staff, Ministry of Defence. *British Air and Space Power Doctrine: AP 3000 Fourth Edition*. Shrivenham, Swindon: Ministry of Defence, 2009.
- Ash, Eric. *Sir Frederick Sykes and the Air Revolution 1912-1918*. Cass Series: Studies in Air Power 8. London: Frank Cass Publishers, 1999.
- Ashmore, E. B. *Air Defence*. London: Longmans, Green and Co. Ltd., 1929.
- Aspinall-Oglander, C. F. *Gallipoli, Volume I, Inception of the Campaign to May 1915*. Vol. 1. 2 vols. Reprint. Official History of the Great War, Military Operations. Uckfield: The Naval & Military Press Ltd, 1929.
- . *Gallipoli, Volume II: May 1915 to the Evacuation*. Vol. 2. 2 vols. Reprint. Official History of the Great War, Military Operations. Uckfield: The Naval & Military Press Ltd, 1931.

- . *Roger Keyes: Being the Biography of Admiral of the Fleet Lord Keyes of Zeebrugge and Dover*. London: The Hogarth Press, 1951.
- Bacon, Reginald. *Benin, The City of Blood*. London: Arnold, 1897.
- . *The Dover Patrol 1915-1917*. Vol. 1. 2 Vols. New York: George H. Doran Company, 1919.
- . *The Dover Patrol 1915-1917*. Vol. 2. 2 Vols. New York: George H. Doran Company, 1919.
- Balfour, Arthur. *The Navy and the War, August 1914 to August 1915*. Kindle ebook. London: Darling and Son, Ltd, 1915.
- Barker, Ralph. *A Brief History of the Royal Flying Corps in World War I*. London: Constable & Robinson Ltd, 2002.
- Bartlett, C. P. O. *Bomber Pilot 1916 - 1918*. Edited by Chaz Bowyer. London: Ian Allan Ltd, 1974.
- Beaverbrook, Lord. *Politicians and the War, 1914-1916*. New York: Doubleday, Doran & Company, Inc., 1928.
- . *Men and Power, 1917-1918*. London: Hutchinson, 1956.
- Beesly, Patrick. *Room 40: British Naval Intelligence 1914-1918*. London: Hamish Hamilton Ltd., 1982.
- Belafi, Michael. *The Zeppelin*. Translated by Cordula Werschkun. Ebook. Barnsley: Pen & Sword Aviation, 2015.
- Bell, A. C. *The Blockade of Germany, and of the countries associated with her in the great war, Austria-Hungary, Bulgaria, and Turkey, 1914-1918*. Reprint. Uckfield: Naval & Military Press Ltd, 1937.
- Bell, Christopher M. *Churchill And Sea Power*. Oxford: Oxford University Press, 2013.
- . *Churchill And The Dardanelles*. Oxford, United Kingdom: Oxford University Press, 2017.
- Bell Davies, Richard. *Sailor in the Air: The Memoirs of the World's First Carrier Pilot*. Barnsley: Seaforth Publishing, 2008.
- Benbow, Tim, ed. *British Naval Aviation: The First 100 Years*. Farnham: Ashgate Publishing Limited, 2011.
- . *Naval Warfare 1914-1918*. Kindle ebook. The History of World War I. London: Amber Books Ltd, 2011.
- . *The Magic Bullet? Understanding the Revolution in Military Affairs*. London: Chrysalis Books Group, 2004.
- Bewsher, Paul. 'Green Balls' *The Adventures of a Night-Bomber*. London: William Blackwood and Sons, 1919.
- Bilbe, Tina. *Kingsnorth Airship Station: In Defence of the Nation*. Kindle ebook. The History Press, 2014.
- Black, Nicholas. *The British Naval Staff In The First World War*. Rochester: Boydell & Brewer Inc., 2011.
- Brett, R. Dallas. *The History of British Aviation, 1908-1914*. Vol. 1. 2 vols. London: The Aviation Book Club, 1933.
- . *The History of British Aviation, 1908-1914*. Combined ed. Surrey: Air Research Publications, 1988.
- Brock, Michael, and Eleanor Brock, eds. *H. H. Asquith Letters to Venetia Stanley*. Oxford University Press, 1985.
- Brooks, John. *The Battle of Jutland*. Cambridge University Press, 2016.

- Brooks, Peter W. *Zeppelin: Rigid Airships 1893-1940*. Washington, D.C.: Smithsonian Institution Press, 1992.
- Burns, Ian M. *The RNAS and the Birth of the Aircraft Carrier, 1914-1918*. Ebook. Oxford: Fonthill, 2014.
- . *Ben-My-Chree, Woman of My Heart: Isle of Man Packet Steamer and Seaplane Carrier*. Leicester: Colin Huston, 2008.
- Campbell, John. *Jutland: An Analysis of the Fighting*. First edition. New York: Lyons Press, 1998.
- Castle, Ian. *British Airships, 1905-1930*. Oxford: Osprey Publishing, 2009.
- . *The First Blitz: Bombing London in the First World War*. New York: Osprey Publishing, 2015.
- Chichering, Roger. *Imperial Germany and the Great War, 1914-1918*. Cambridge: Cambridge University Press, 2004.
- Churchill, Randolph S. *Winston S. Churchill: Young Statesman, 1901-1914*. Ebook. Vol. 2. 8 Vols. Hillsdale, Michigan: Hillsdale College Press, 2015.
- Churchill, Winston. *The World Crisis: 1911-1914*. Ebook. Vol. 1. 4 vols. New York: RosettaBooks, LLC, 2013, originally published 1923.
- . *The World Crisis: Part II, 1915*. Ebook. Vol. 2. 4 vols. New York: RosettaBooks, LLC, 2013, originally published 1923.
- . *The World Crisis: Part III, 1916-1918*. Ebook. Vol. 3. 4 vols. New York: RosettaBooks, LLC, 2013, originally published 1927.
- . *The World Crisis: Part IV, The Aftermath*. Ebook. Vol. 4. 4 vols. New York: RosettaBooks, LLC, 2013, originally published 1931.
- Clark-Hall, R. H., and J. L. Clark-Hall. *Air Marshal Sir Robert Clark-Hall, K.B.E. C.M.G. D.S.O.* Christchurch, New Zealand: The Raven Press Co. Ltd, 1995.
- Cliffe, Steve. *Churchill, Kitchener and Lloyd George: First World Warlords*. Kindle ebook. Oxford: Fonthill Media, Ltd. 2014.
- Cole, Christopher, and E. F. Cheesman. *The Air Defence of Britain 1914-1918*. London: The Bodley Head Ltd, 1984.
- Colledge, J. J., and Ben Warlow. *Ships of the Royal Navy, The Complete Record of All Fighting Ships of the Royal Navy*. Philadelphia & Newbury: Casemate, 2010.
- Cooke, David. *Sky Battle: 1914-1918, The Story of Aviation in World War I*. New York: W. W. Norton & Company, Inc., 1970.
- Cooper, Malcolm. *The Birth of Independent Air Power*. London: Allen & Unwin, 1986.
- Corbett, Julian. *Naval Operations*. Vol. 1. 5 vols. History of the Great War Based on Official Documents. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1920.
- . *Naval Operations*. Vol. 2. 5 vols. History of the Great War Based on Official Documents. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1921.

- . *Naval Operations*. Vol. 3. 5 vols. History of the Great War Based on Official Documents. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1923.
- . *Principles of Maritime Strategy*. Mineola: Dover Publications, Inc., 2004.
- Creagh, O'Moore and E. M. Humpris, *The V.C. and D.S.O. Book*, 3 vols. Naval & Military Press reprint, London: The Standard Art Book Co. Ltd, 1920.
- Cronin, Dick. *Royal Navy Shipboard Aircraft Developments, 1912-1931*. Tonbridge: Air Britain (Historians) Ltd, 1990.
- Cumming, Anthony J. *The Battle for Britain: Interservice Rivalry between the Royal Air Force and Royal Navy, 1909-40*. Annapolis: Naval Institute Press, 2015.
- D'Eyncourt, Eustace Tennyson. *A Shipbuilder's Yarn, the Record of a Naval Constructor*. London: Hutchinson & Co., Ltd, 1948.
- Darling, Kev. *Fleet Air Arm Carrier War: The History of British Naval Aviation*. Barnsley: Pen & Sword Aviation, 2009.
- Dunn, Steve. *Securing The Narrow Sea: The Dover Patrol, 1914-1918*. Barnsley: Seaforth Publishing, 2017.
- . *Bayly's War: The Battle for the Western Approaches in the First World War*. Barnsley: Pen & Sword Books Ltd, 2018.
- Easdown, Martin, and Thomas Genth. *A Glint in the Sky: German Air Attacks on Folkestone, Dover, Ramsgate, Margate and Sheerness During the First World War*. Pen & Sword, 2005.
- Edgerton, David. *England and the Aeroplane: Militarism, Modernity and Machines*. Kindle ebook. Penguin Books, 2013.
- Emmerson, Charles. *1913: The World before the Great War*. London: Vintage Books, 2013.
- Fawcett, H. W., and W. W. Hooper, eds. *The Fighting at Jutland*. Driffield: Oakpost Ltd, 2010.
- Fayle, Charles Ernest. *Seaborne Trade: The Cruiser Period*. Vol. 1, 3 vols. Reprint, Uckfield: Naval & Military Press, Ltd, originally published 1920.
- . *Seaborne Trade: Submarine Campaign*. Vol. 2, 3 vols. Reprint, Uckfield: Naval & Military Press, Ltd, originally published 1923.
- . *Seaborne Trade: Submarine Warfare*. Vol. 3, 3 vols. Reprint, Uckfield: Naval & Military Press, Ltd, originally published 1924.
- Fife, Malcolm. *British Airship Bases of the Twentieth Century*. Kindle ebook. Oxford: Fonthill Media Limited, 2015.
- Finnis, Bill. *The History of the Fleet Air Arm: From Kites to Carriers*. Shrewsbury: Airline Publishing Ltd., 2000.
- Fisher, John. *Memories*. London: Hodder and Stoughton, 1919.
- . *Records*. London: Hodder and Stoughton, 1919.
- Fontenoy, Paul. *Aircraft Carriers: An Illustrated History of Their Impact*. Weapons and Warfare Series. Santa Barbara, California: ABC-Clío, Inc., 2006.

- Fredette, Raymond. *The First Battle of Britain, 1917-1918*. London: Cassell and Company, Ltd, 1966.
- Freeman, Richard. *Tempestuous Genius: The Life of Admiral of the Fleet Lord Fisher*. Kindle ebook. Endeavour Press Ltd., 2015.
- Ferguson, Niall. *The Pity of War*. New York: Basic Books, 1999.
- Fuller, J. F. C. *A Military History of the Western World, Volume III: From the American Civil War to the End of World War II*. Vol. 3. 3 vols. New York: Da Capo Press, Inc., 1956.
- Gamble, Charles Frederick. *The Story of a North Sea Air Station*. Oxford University Press, 1928.
- Gardiner, Ian. *The Flatpack Bombers: The Royal Navy and the 'Zeppelin Menace.'* Kindle ebook. Barnsley: Pen & Sword Military, 2009.
- Gibson, Mary. *Warneford, VC*. Yeovilton: The Fleet Air Arm Museum, 1979.
- Gibson, R. H., and Maurice Prendergast. *The German Submarine War, 1914-1918*. Revised edition. London: Naval & Military Press, 2003.
- Gilbert, Martin. *The Challenge of War: Winston S. Churchill, 1914-1916*. Minerva edition. Vol. 3. 8 vols. London: Mandarin Paperbacks, 1990.
- Gilmour, David. *Curzon, Imperial Statesman*. New York: Farrar, Straus and Giroux, 2003.
- Glanfield, John. *The Devil's Chariots: The Origins and Secret Battles of Tanks in the First World War*. Kindle ebook. New York: Osprey Publishing, 2013.
- Goerlitz, Walter. *The History of the German General Staff, 1657-1945*. Trans. Brian Battershaw. New York: Frederick A. Praeger, Publishers, 1961.
- Goldrick, James. *The King's Ships Were at Sea: The War in the North Sea, August 1914 – February 1915*. Annapolis: Naval Institute Press, 1984.
- Gordon, Andrew. *The Rules of the Game*. London: John Murray, 1996.
- Gough, Barry. *Historical Dreadnoughts: Arthur Marder, Stephen Roskill and Battles for Naval History*. Barnsley: Seaforth Publishing, 2010.
- Goulter, Christina J. M. *A Forgotten Offensive: Royal Air Force Coastal Command's Anti-Shipping Campaign, 1940-1945*. Kindle ebook. Abingdon: Routledge, 2013.
- Grainger, John D. *Dictionary of British Naval Battles*. Woodbridge: The Boydell Press, 2016.
- Grant, Robert M. *U-Boats Destroyed: The Effect of Anti-Submarine Warfare, 1914-1918*. London: Putnam, 1964.
- Grattan, Robert F. *The Origins of Air War*. International Library of War Studies 13. New York: I. B. Tauris, 2009.
- Gray, Randal, ed. *Conway's All The World's Fighting Ships 1906 - 1921*. London: Conway Maritime Press, 1985.
- Grayzel, Susan R. *At Home and Under Fire: Air Raids and Culture in Britain from the Great War to the Blitz*. Kindle ebook. Cambridge University Press, 2012.
- Grey, Charles. *Bombers*. London: Faber & Faber Ltd., 1941.

- . *Sea-Flyers*. London: Faber & Faber Ltd., 1942.
- Grove, Eric. *The Royal Navy since 1815*. New York: Palgrave Macmillan, 2005.
- Guinn, Paul. *British Strategy and Politics, 1914-1918*. Oxford: Clarendon Press, 1965.
- Gunn, Roger. *Raymond Collishaw and the Black Flight*. Toronto: Dundurn, 2013.
- Hackmann, Willem. *Seek & Strike: Sonar, Anti-Submarine Warfare and the Royal Navy, 1914-54*. London: Her Majesty's Stationery Office, 1984.
- Halevy, Elie. *The Rule of Democracy, 1905-1914*. Trans. E. I. Watkin. Vol. 6. 6 vols. London: Ernest Benn Limited, 1961.
- Hallam, Theodore Douglas. *The Spider Web*. Driffeld: Leonaur, 2009.
- Halpern, Paul G., ed. *The Keyes Papers: Selections from the Private and Official Correspondence of Admiral of the Fleet Baron Keyes of Zeebrugge*. Vol. I: 1914-1918. 2 Vols. Navy Records Society 117. London: Navy Records Society, 1972.
- . ed. *The Royal Navy in the Mediterranean, 1915-1918*. Navy Records Society 128. Aldershot, Hants: Temple Smith, 1987.
- Harding, E. D., and Peter Chapman, eds. *A History of Number 16 Squadron: Royal Naval Air Service*. Peter Chapman, 2006.
- Hartcup, Guy. *The Achievement of the Airship: A History of the Development of Rigid, Semi-Rigid, and Non-Rigid Airships*. London: David & Charles, 1974.
- Haskew, Michael E. *Aircraft Carriers: The Illustrated History of the World's Most Important Warships*. Minneapolis, USA: Zenith Press, 2016.
- Haslop, Dennis. *Early Naval Air Power: British and German Approaches*. Kindle ebook. London: Routledge, 2018.
- Hattersley, Roy. *David Lloyd George, The Great Outsider*. London: Abacus, 2012.
- Havighurst, Alfred F. *Britain in Transition: The Twentieth Century*. 4th ed. Chicago: University of Chicago Press, 1985.
- Henshaw, Trevor. *The Sky Their Battlefield II: Air Fighting and Air Casualties of the Great War*, 2nd ed. High Barnet: Fetubi Books, 2014.
- Hernon, Ian. *Britain's Forgotten Wars: Colonial Campaigns of the 19th Century*. Stroud: Sutton Publishing, 2007.
- Herris, Jack, and Bob Pearson. *Aircraft of World War I, 1914-1918*. The Essential Aircraft Identification Guide. London: Amber Books Ltd, 2014.
- Higham, Robin. *The British Rigid Airship, 1908-1931: A Study in Weapons Policy*. London: G. T. Foulis & Co. Ltd, 1961.
- Hobbs, David. *British Aircraft Carriers, Design, Development and Service Histories*. Barnsley: Seaforth Publishing, 2013.
- . *The Royal Navy's Air Service in the Great War*. Barnsley: Seaforth Publishing, 2017.
- Hurd, Archibald. *The Merchant Navy*. Vol. I. 3 vols. London: John Murray, 1921.

- Hyde, Andrew. *The First Blitz: The German Air Campaign Against Britain, 1917-1918*. Kindle ebook. London: Leo Cooper, 2012.
- James, Lawrence. *The Savage Wars: British Campaigns in Africa, 1870-1920*. New York: St. Martin's Press, 1986.
- Jarrett, Phillip. *Frank McClean: The Godfather of British Naval Aviation*. Barnsley: Seaforth Publishing, 2011.
- Jellicoe, John. *The Grand Fleet 1914-1916: Its Creation, Development and Work*. Kindle ebook. London: Not So Noble Books, originally published 1919.
- . *The Crisis of the Naval War*. London: Cassell and Company, Ltd, 1920.
- . *The Crisis of the Naval War*. Ebook. London: Cassell and Company, Ltd, 1920.
- . *The Submarine Peril*. London: Cassell & Co. Ltd., 1934.
- Jellicoe, Nicholas. *Jutland: The Unfinished Battle*. Croydon: Seaforth Publishing, 2016.
- Jones, H. A. *The War In The Air*. Vol. 2. 6 vols. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1928.
- . *The War In The Air*. Vol. 3. 6 vols. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1931.
- . *The War In The Air*. Vol. 4. 6 vols. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1934.
- . *The War In The Air*. Vol. 5. 6 vols. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1935.
- . *The War In The Air: Appendices*. Reprint. London: The Naval & Military Press Ltd, originally published 1937.
- Jones, Neville. *The Origins of Strategic Bombing*. London: William Kimber & Co. Limited, 1973.
- Joubert, Philip. *The Third Service, The Story Behind the Royal Air Force*. London: Thames & Hudson, 1955.
- Keegan, John. *The Price of Admiralty*. New York: Penguin Books, 1990.
- . *The First World War*. Vintage Canada. Toronto: Random House of Canada Ltd., 2000.
- Kemp, P. K. H. M. *Submarines*. London: Herbert Jenkins Ltd., 1953.
- . *Fleet Air Arm*. London: Herbert Jenkins Ltd., 1954.
- Kennedy, Paul. *The Rise and Fall of British Naval Mastery*. New York: Humanity Books, 1998.
- Kennett, Lee. *The First Air War: 1914-1918*. New York: The Free Press, 1991.
- Kerr, Mark. *Land, Sea, and Air*. London: Longmans, Green and Co. Ltd., 1927.
- Keyes, Roger. *The Naval Memoirs of Admiral of the Fleet Sir Roger Keyes*. 2 vols. London: Thornton Butterworth, 1934.

- King, Brad. *Royal Naval Air Service, 1912-1918*. Aldershot: Hikoki Publications, 1997.
- King, H. F. *Armament of British Aircraft, 1909-1939*. London: Putnam & Company Limited, 1971.
- Kinsey, Gordon. *Pulham Pigs: The History of an Airship Station*. Lavenham: Terrence Dalton, 1988.
- . *Seaplanes - Felixstowe: The Story of the Air Station, 1913-1963*. Lavenham: Terrence Dalton, 1978.
- Lambert, Andrew. *The Foundations of Naval History, John Knox Laughton, the Royal Navy and the Historical Profession*. London: Chatham Publishing, 1998.
- . *Admirals: The Naval Commanders Who Made Britain Great*. London: Faber and Faber Limited, 2008.
- Lambert, Nicholas. *The Submarine Service, 1900-1918*. Online. Navy Records Society 142. London: Ashgate Publishing Company, 2001.
- . *Sir John Fisher's Naval Revolution*. Columbia: University of South Carolina Press, 2002.
- . *Planning Armageddon: British Economic Warfare and the First World War*. Cambridge, MA: Harvard University Press, 2012.
- Langham, Rob. *Bloody Paralyser: The Giant Handley Page Bombers of the First World War*. Kindle ebook. Croydon: Fonthill Media Limited, 2016.
- Larn, Richard. *The Isles of Scilly in the Great War*. Barnsley: Pen & Sword Books, Ltd., 2017.
- Layman, Richard. *Before the Aircraft Carrier: Development of Aviation Vessels, 1849-1922*. London: Conway Maritime Press, Ltd., 1989.
- . *Naval Aviation in the First World War: Its Impact and Influence*. London: Chatham Publishing, 1996.
- . *The Cuxhaven Raid: The World's First Carrier Air Strike*. London: Conway Maritime Press, Ltd., 1985.
- Lea, John. *Reggie, The Life of Air Vice Marshal R L G Marix CB DSO*. Durham: The Pentland Press Ltd, 1994.
- Lewis, Bruce. *A Few of the First*. London: Leo Cooper, 1997.
- Lewis, Peter. *Squadron Histories: RFC, RNAS, and RAF, 1912-1959*. London: Putnam, 1959.
- Llewellyn-Jones, Malcolm. *The Royal Navy and Anti-Submarine Warfare, 1917-1949*. New York: Routledge, 2006.
- London, Peter. *U-Boat Hunters: Cornwall's Air War, 1916-1919*. Truro: Dyllansow Truran, 1999.
- Longmore, Arthur. *From Sea to Sky: 1910-1945*. London: Geoffrey Bles, 1946.
- Longstaff, Reginald. *The Fleet Air Arm: A Pictorial History*. London: Robert Hale Ltd., 1981.
- Lloyd, Godfrey, ed. *The Ministry of Munitions*. Vol. 12. 12 vols. Reprint. Uckfield: Naval & Military Press, 1921.
- MacDougall, Philip. *When The Navy Took To The Air: The Experimental Seaplane Stations of the Royal Naval Air Service*. Croydon: Fonthill Media, 2017.
- Manchester, William. *The Last Lion, Winston Spencer Churchill: Visions of Glory, 1974 - 1932*. Boston: Little, Brown, and Company., 1983.

- Manning, T. D. and C. F. Walker. *British Warship Names*. London: Putnam, 1959.
- Manstan, Roy R. *The Listeners: U-boat Hunters During the Great War*. Middletown, Connecticut: Wesleyan University Press, 2018
- Marder, Arthur. *From the Dardanelles to Oran: Studies of the Royal Navy in War and Peace, 1915-1940*. Barnsley: Seaforth Publishing, 2015, originally published 1974.
- . *From the Dreadnought to Scapa Flow: Volume I The Road to War 1904-1914*. Vol. 1. 5 vols. Annapolis: Naval Institute Press, 2013, originally published 1961.
- . *From The Dreadnought to Scapa Flow Volume II: The War Years to the Eve of Jutland 1914-1916*. Vol. 2. 5 vols. Annapolis: Naval Institute Press, 2013, originally published 1965.
- . *From the Dreadnought to Scapa Flow: Volume III Jutland and After*. Vol. 3. 5 vols. Annapolis: Naval Institute Press, 2013, originally published 1966.
- . *From The Dreadnought to Scapa Flow Volume IV: The Year of Crisis*. Vol. 4. 5 vols. Annapolis: Naval Institute Press, 2014, originally published 1969.
- . *From the Dreadnought to Scapa Flow: Volume V Victory and Aftermath: 1918-1919*. Vol. 5. 5 vols. Annapolis: Naval Institute Press, 2014, originally published 1970
- , ed. *Portrait of an Admiral, The Life And Papers Of Herbert Richmond*. Cambridge, MA: Harvard University Press, 1952.
- Massie, Robert K. *Dreadnought: Britain, Germany, and the Coming of the Great War*. New York: Random House, 1991.
- . *Castles of Steel: Britain, Germany, and the Winning of the Great War at Sea*. New York: Ballantine Books, 2003.
- Messimer, Dwight. *Find and Destroy: Antisubmarine Warfare in World War I*. Annapolis: Naval Institute Press, 2001.
- . *Verschollen: World War I U-Boat Losses*. Annapolis: Naval Institute Press, 2002.
- Miller, Russell. *Trenchard: Father of the Royal Air Force*. Kindle ebook, London: Weidenfeld & Nicolson, 2016.
- Moller, Eberhard, and Werner Brack. *The Encyclopedia of U-Boats from 1904 to the Present Day*. Translated by Andrea Battson and Roger Chesneau. London: Greenhill Books, 2004.
- Moore, John, ed. *Jane's Fighting Ships of World War I*. London: Random House Group Ltd, 2001.
- Morgan-Owen, David. *The Fear of Invasion: Strategy, Politics, and British War Planning, 1880-1914*. Oxford University Press, 2017.
- Morris, Alan. *First Of The Many, The Story of Independent Force, RAF*. London: Jarrolds Publishers, Ltd., 1968.
- Morris, Joseph. *German Air Raids on Britain 1914-1918*. Dallington, East Sussex: The Naval & Military Press Ltd, 1993.
- Mosley, Leonard. *Curzon: The End of an Epoch*. London: Longmans, Green & Co., 1961.
- Mowthorpe, C. E. S. *Battlebags: British Airships of the First World War*. Stroud: Sutton Publishing, 1998.

- Neumann, Georg Paul. *The German Air Force in the Great War*. Trans. J. E. Gurdon. Reprint. Uckfield, Naval & Military Press Ltd, 1920.
- Newbolt, Henry. *Naval Operations*. Vol. 4. 5 vols. The Naval History of the Great War. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1928.
- . *Naval Operations*. Vol. 5. 5 vols. The Naval History of the Great War. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1931.
- O'Connor, Mike. *Airfields & Airmen of the Channel Coast*. Kindle ebook. Barnsley: Pen & Sword Military, 2005.
- Oliver, John. *Samson and the Dunkirk Circus, 3 Squadron Royal Naval Air Service, 1914-15*. San Bernardino, CA: CreateSpace Independent Publishing Platform, 2017.
- Overy, Richard. *The Birth of the RAF, 1918*. Kindle ebook. London: Allen Lane, 2018.
- Owen, Frank. *Tempestuous Journey: Lloyd George His Life And Times*. London: Hutchinson, 1954.
- Parton, Neville. *The Evolution and Impact of Royal Air Force Doctrine, 1919-1939*. New York: Bloomsbury Academic, 2013.
- Peattie, Mark. *Sunburst, The Rise of Japanese Naval Air Power, 1909-1941*. Kindle ebook. Annapolis: Naval Institute Press, 2001.
- Philpott, Ian. *The Birth of the Royal Air Force*. Kindle ebook. Barnsley: Pen & Sword Military, 2013.
- Philpott, Maryam. *Air and Sea Power in World War I: Combat and Experience in the Royal Flying Corps and the Royal Navy In The Great War*. London: I. B. Tauris & Co. Ltd., 2013.
- Popham, Hugh. *Into Wind*. Bath: Hamish Hamilton Ltd., 1969.
- , & Robin Popham, eds. *A Thirst for The Sea: The Sailing Adventures of Erskine Childers*. London: Stanford Maritime Limited, 1979.
- Price, Alfred. *Aircraft versus Submarines: The Evolution of the Anti-Submarine Aircraft 1912 to 1972*. London: William Kimber, 1973.
- Pugh, James. *The Royal Flying Corps, the Western Front and the Control of the Air, 1914-1918*. Ebook. New York: Routledge, 2017.
- Raleigh, Walter. *The War In The Air*. Vol. 1. 6 Vols. Reprint. Uckfield: The Naval & Military Press Ltd, originally published 1922.
- Ranft, Bryan, ed. *The Beatty Papers: Volume I, 1902-1918*. Vol. 1. 2 vols. Navy Records Society 128. Brookfield: Gower Publishing Company, 1989.
- , ed. *The Beatty Papers: Volume II, 1916-1927*. Vol. 2. 2 vols. Navy Records Society 132. Brookfield: Ashgate Publishing Company, 1993.
- Reader, W. J. *Architect of Air Power: The Life of the First Viscount Weir*. London: Collins, 1968.
- Redford, Duncan, and Philip. D. Grove. *The Royal Navy, A History Since 1900*. A History of the Royal Navy Series 14. New York: I. B. Tauris, 2014.

- Robbins, Guy. *The Aircraft Carrier Story 1908-1945*. London: Cassel & Co, 2001.
- Robertson, Bruce, ed. *Sopwith – The Man and his Aircraft*. Bedford: The Sidney Press, Ltd, 1970.
- Robinson, Douglas H. *Giants in the Sky: History of the Rigid Airship*. London: G. T. Foulis & Co. Ltd., 1973.
- . *The Zeppelin in Combat: A History of the German Naval Airship Division, 1912-1918*. Ebook. London: Schiffer Military History, 1997.
- Rodger, N. A. M. *The Admiralty*. Offices of State 3. Suffolk: Lavenham Press Limited, 1979.
- Roksund, Arne. *The Jeune Ecole: The Strategy of the Weak*. Boston: Brill, 2007.
- Roskill, Stephen. *Naval Policy Between the War: The Period of Anglo-American Antagonism, 1919-1929*. Vol. 1. 2 vols. London: Collins, 1968.
- , ed. *Documents Relating to the Naval Air Service. Volume I, 1908-1918*. London: Spottiswoode, Ballantyne and Co. Ltd., 1969.
- . *Hankey: Man of Secrets*. Vol. Volume I: 1877-1918. Vol. 1, 3 vols. Annapolis: Naval Institute Press, 1970
- . *Admiral of the Fleet Earl Beatty: The Last Naval Hero*. New York: Antheneum, 1981.
- . *Churchill and the Admirals*. Barnsley: Pen & Sword Military Classics, 2004.
- Rossano, Geoffrey L. *Stalking the U-Boat, U.S. Naval Aviation in Europe during World War I*. Gainesville: University Press of Florida, 2010.
- Rossano, Geoffrey, and Thomas Wildenberg. *Striking the Hornets' Nest*. Annapolis: Naval Institute Press, 2015.
- Royle, Trevor. *The Kitchener Enigma: The Life and Death of Lord Kitchener of Khartoum, 1850-1916*. Port Stroud: The History Press, 2016.
- Samson, Charles Rumney. *Fights and Flights*. Nashville: The Battery Press, 1930.
- Schleihauf, William, ed. *Jutland: The Naval Staff Appreciation*. Barnsley: Seaforth Publishing, 2016.
- Schurman, D. M. *The Education of a Navy, The development of British naval strategic thought, 1867-1914*. Malabar, Florida: Robert E. Krieger Publishing Company, 1984.
- Scott, Percy. *Fifty Years in the Royal Navy*. Kindle ebook. Endeavour Press Ltd., 2015.
- Seligmann, Matthew, ed. *Naval Intelligence from Germany: The Reports of the British Naval Ataches in Berlin, 1906 - 1914*. Navy Records Society 152. Aldershot: Ashgate Publishing Limited, 2007.
- Sheely, Irving. *Sailor of the Air: The 1917-1919 Letters & Diary of USN CMM/A Irving Edward Sheely*. Edited by Lawrence Sheely. Tuscaloosa: University of Alabama Press, 1993.
- Sheffield, Gary. *The Chief: Douglas Haig and the British Army*. Kindle ebook. London: Aurum Press Ltd, 2011.
- . *Forgotten Victory, The First World: Myths and Realities*. Kindle ebook. Endeavour Press Ltd., 2014.
- Sims, William. *The Victory at Sea*. Annapolis: Naval Institute Press, 2016.

- Smith, John T. *Gone to Russia to Fight: The RAF in South Russia, 1918-1920*. Stroud: Amberley Publishing Plc, 2010.
- Smith, Malcolm. *Voices in Flight: The Royal Naval Air Service During the Great War*. Barnsley: Pen & Sword Military Classics, 2014.
- Spaight, J. M. *Air Power And The Next War*. London: Geoffrey Bles, 1938.
- Stern, Albert G. *Tanks: 1914-1918*. Uckfield: The Naval & Military Press Ltd, 1919.
- Storey, Neil R. *The Zeppelin Blitz*. Ebook. Stroud: The History Press, 2015.
- Strachan, Hew. *The First World War: Volume I: To Arms*. Oxford University Press, 2003.
- Sturtivant, Ray. *British Naval Aviation: The Fleet Air Arm, 1917 - 1990*. London: Arms & Armour Press Ltd., 1990.
- Sturtivant, Ray, and Gordon Page. *Royal Navy Aircraft Serials and Units, 1911-1919*. Tonbridge: Air Britain (Historians) Ltd, 1992.
- Sueter, Murray. *Airmen or Noths: Fair Play for Our Airmen, the Great "Neon" Air Myth Exposed*. London: Sir Isaac Pitman & Sons, Ltd., 1928.
- . *The Evolution of the Submarine Boat, Mine and Torpedo, from the Sixteenth Century to the Present Time*. Portsmouth: J. Griffin and Company, 1907.
- . *The Evolution of the Tank: A Record of the Royal Naval Air Service Caterpillar Experiments*. London: Hutchinson & Co. Publishers Ltd, 1937.
- Sumida, Jon Tetsuro. *In Defence of Naval Supremacy: Finance, Technology, and British Naval Policy, 1889-1914*. Annapolis: Naval Institute Press, 1993.
- Sutherland, Jonathan, and Diane Canwell. *Battle of Britain 1917: The First Heavy Bomber Raids on England*. Kindle ebook. Barnsley: Pen & Sword Aviation, 2006.
- Swanston, Alexander, and Malcolm Swanston. *Atlas of Air Warfare*. Heatherton Victoria: Hinkler Books Pty Ltd, 2009.
- Swinton, Ernest D. *Over My Shoulder: The Autobiography of Sir Ernest D. Swinton*. G. Roland, 1951.
- Sykes, F. H. *Aviation in Peace and War*. London: Edward Arnold & Co., 1922.
- Tarrant, V. E. *The U-Boat Offensive, 1914-1945*. London: Cassel & Co., 2000.
- Taylor, A. J. P. *English History, 1914-1945*. Oxford University Press, 1985.
- Taylor, John W. R. C. F. S. *Birthplace of Air Power*. London: Jane's Publishing Company, Limited, 1987.
- Temple Patterson, A., ed. *The Jellicoe Papers, Volume I: 1893-1916*. Vol. 1. 2 vols. London: Spottiswoode, Ballantyne and Co. Ltd., 1966.
- , ed. *The Jellicoe Papers, Volume II: 1916-1935*. Vol. 2. 2 vols. London: Spottiswoode, Ballantyne and Co. Ltd., 1968.
- . *Tyrwhitt of the Harwich Force: The Life of the Admiral of the Fleet, Sir Reginald Tyrwhitt*. London: Macdonald & Jane's, 1973.

- Termote, Tomas. *Krieg Unter Wasser: Unterseebootflotille Flandern, 1915-1918*. Kindle ebook. Hamburg: E. S. Mittler & Sohn, 2015.
- Terraine, John. *Business in Great Waters: The U-boat Wars 1916-1945*, Kindle ebook. Barnsley: Pen & Sword Books Ltd., 2009.
- The Naval Who's Who, 1917*. Polstead: J. B. Hayward & Son, 1981.
- The Phillimore Trust. *The Phillimore Papers, 1798-1945: An Illustrated Guide to a Naval, Political, Country House, and Estate Archive*. Phillimore Family Trust, 1997.
- Thetford, Owen. *British Naval Aircraft since 1912*. 4th ed. London: Putnam, 1978.
- Thompson, J. Lee. *Lord Northcliffe & The Great War: Politicians, the Press & Propaganda*. Kindle ebook. Kent, Ohio: Kent State University Press, 1999.
- Till, Geoffrey. *Air Power and the Royal Navy, 1914-1945, A Historical Survey*. London: Jane's Publishing Company, 1979.
- Travers, E. *Cross Country*. Sittingbourne: Hothersall & Travers, 1989.
- Treadwell, Terry. *The First Naval Air War*. Stroud: The History Press, Ltd, 2010.
- Trimble, William F. *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation*. Annapolis: Naval Institute Press, 2010.
- Tuchman, Barbara W. *The Zimmermann Telegram*. New York: Ballantine Books, 1994.
- Turpin, Brian J. *Coastal Patrol: Royal Navy Airship Operations During the Great War 1914-1918*. Kindle ebook. Fonthill Media Limited, 2016.
- Ventry, Lord, and Eugene Kolesnik. *Jane's Pocket Book of Airship Development*. The Book Service Ltd., 1976.
- Warner, Guy. *Airships Over Ulster: Royal Naval Air Service Airships During the First World War*. Newtownards: Colourpoint Books, 2012.
- . *Lighter Than Air: The Life and Times of Wing Commander N. F. Usborne RN*. Kindle ebook. Barnsley: Pen & Sword Aviation, 2016.
- Wells, H. G. *The War In The Air*. London: The Pall Mall Magazine, 1908.
- Westrop, Mike. *A History of No. 6 Squadron: Royal Naval Air Service in World War I*. Atglen, PA: Schiffer Publishing, Limited, 2006.
- . *A History of No.10 Squadron Royal Naval Air Service in World War I*. Atglen, PA: Schiffer Military History, 2004.
- Whale, George. *British Airships: Past, Present and Future*. Kindle ebook. New York: Wallachia Publishers, 1919.
- White, Jerry. *Zeppelin Nights: London in the First World War*. London: The Bodley Head, 2014.
- Williams, Geoffrey. *Wings Over Westgate: The Story of a Front Line Naval Air Station During World War I*. Malling, Kent: Kent County Library, 1985.

Williams, George K. *Biplanes And Bombsights: British Bombing In World War I*. Kindle ebook. Pickle Partners Publishing, 2014.

Winter, Jay, ed. *The Cambridge History of The First World War: Volume I, Global War*. Vol. 1. 3 vols. Cambridge University Press, 2014

Wood, Alan C. *Aces and Airmen of World War I*. London: Brassey's, 2002.

Wragg, David. *A Century of British Naval Aviation, 1909-2009*. Barnsley: Pen & Sword Maritime, 2009.

———. *Wings Over The Sea, A History of Naval Aviation*. New York: Arco Publishing, Inc., 1979.

Young, Desmond. *Rutland of Jutland*. London: Cassell, 1963.

Articles & Book Chapters

Abbatiello, John J. 'Doctrinal Innovation in the Royal Naval Air Service: Samson, Longmore, and Williamson.' *Journal of the Australian Naval Institute*. No. 132 (April 2009): 35–45.

———. 'The Myths and Realities of Air Anti-Submarine Warfare during the Great War.' *Air Power Review*. Vol. 12. No. 1 (2009): 14-31.

Acland, W. R. D. 'The Development of the Fleet Air Arm.' *Journal of the Royal United Services Institution*. Vol. 79. No. 514 (1934): 260–79.

Baddeley, V. W., and Marc Brodie. 'Halsey, Sir Lionel (1972-1949), Naval Officer.' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.

Beach, Jim. 'Issued by the General Staff: Doctrine Writing at British GHQ, 1917-1918.' *War in History*. Vol 19. No. 4 (November 2012): 464–91.

Benbow, Tim. 'Brothers in Arms: The Admiralty, the Air Ministry, and the Battle of the Atlantic, 1940-1943.' *Global War Studies*. Vol. 11. No. 1 (2014): 41–88.

Boothby, F. L. M. 'Aircraft for Sea Service.' *Journal of the Royal United Services Institution*. Vol. 56. No. 1 (June 1912): 751– 80.

Bullen, John. 'The Royal Navy and Air Power: The Projected Torpedo-Bomber Attack on the High Seas Fleet at Wilhemshaven in 1918.' *Imperial War Museum Review*. Vol. 2 (1987).

Burney, C. D. 'Air Power.' *Naval Review Journal*. Vol. 1. No. 2 (1913): 57–75.

Burns, Ian M. 'Woman of My Heart - The Story of Ben-My-Chree, Part I.' *Cross & Cockade International Journal*. Vol. 6. No. 4 (Winter 1975): 145–57.

———. 'Woman of My Heart - The Story of Ben-My-Chree, Part II.' *Cross & Cockade International Journal*. Vol 7. No. 1 (Spring 1976): 1–12.

———. 'Some Raid That, By Cripes! HMS Furious and the Tondern Raid, Part 1, 19 July 1918.' *Cross & Cockade International Journal*. Vol 29. No. 2 (Summer 2018): 83-109.

———. 'Some Raid That, By Cripes! HMS Furious and the Tondern Raid, Part 2, 19 July 1918.' *Cross & Cockade International Journal*. Vol 29. No. 3 (Autumn 2018): 169-196.

- Burns, Ian M., and Roger Nailer. 'HMS Vindex - Mixed Carrier 1915-19.' *Cross & Cockade International Journal*. Vol. 17. No. 3 (1986): 97-111.
- Chilton, Edward. 'Rear Admiral Sir Murray Sueter, CB.' *Cross & Cockade International Journal*. Vol. 15. No. 2 (Summer 1984): 49-55.
- Cooper, Malcolm. 'Blueprint for Confusion: The Administrative Background to the Formation of the Royal Air Force, 1912-19.' *Journal of Contemporary History*. Vol. 22. No. 3 (July 1, 1987): 437-53.
- . 'The British Experience of Strategic Bombing.' *Cross & Cockade International Journal*. Vol. 17. No. 2 (Summer 1986): 49-61.
- Cronin, Dick. 'Tondern: Prelude, Climax and Aftermath.' *Cross & Cockade International Journal*, Vol. 25. No. 2 (Summer 1994): 57-68.
- d'Ombrain, Nicolas J. 'Churchill at the Admiralty and the Committee of Imperial Defence, 1911-1914.' *Journal of the Royal United Services Institution*. Vol. 115. No. 657 (1970): 38-41.
- Douglas, W. A. B. 'The R.N.A.S. in Combined Operations 1914-1915.' In *Dreadnought to Polaris: Maritime Strategy since Mahan*, edited by A. M. J Hyatt, 19-29. Vancouver: The Copp Clark Publishing Company, 1973.
- Ferris, John. 'Achieving Air Ascendancy: Challenge and Response in British Strategic Air Defence, 1915-40.' In *Air Power History: Turning Points from Kitty Hawk to Kosovo*, edited by Sebastian Cox and Peter Gray, 21-50. Cass Series: Studies in Air Power 13. New York: Frank Cass Publishers, 2002.
- . '"Airbandit": C3I and Strategic Air Defence during the First Battle of Britain, 1915-18.' In *Strategy & Intelligence: British Policy During the First World War*, 23-66. London: The Hambledon Press, 1996.
- Gavroglu, Kostas. 'Strutt, John William, Third Baron Rayleigh (1842-1919).' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.
- Goodall, Michael. 'The Admiralty Competition Bombers, 1915-1916.' *Cross & Cockade International Journal*. Vol. 5. No. 2 (Summer 1974): 67-74.
- . 'F E T Hewlett and the Cuxhaven Raid.' *Cross & Cockade International Journal*. Vol. 6. No. 2 (Summer 1975): 70-72.
- Goulter, Christina J. M. 'The Royal Naval Air Service: A Very Modern Force.' In *Air Power History: Turning Points from Kitty Hawk to Kosovo*, edited by Sebastian Cox and Peter Gray, 51-65. New York: Frank Cass Publishers, 2002.
- Gray, Peter. 'The Air Ministry and the Formation of the Royal Air Force.' In *Changing War: The British Army, the Hundred Days Campaign and The Birth of the Royal Air Force, 1918*, edited by Gary Sheffield and Peter Gray, Kindle ebook, 135-48. Birmingham War Studies. London: Bloomsbury, 2013.
- Grove, Eric. 'Air Force, Fleet Air Arm - or Armoured Corps? The Royal Naval Air Service at War.' In *British Naval Aviation*, edited by Tim Benbow, 27-56. Farnham: Ashgate Publishing Limited, 2011.
- . 'Seamen or Airmen? The Early Days of British Naval Flying.' In *British Naval Aviation: The First 100 Years*, edited by Tim Benbow, 7-26. Farnham: Ashgate Publishing Limited, 2011.
- . 'The Discovery of Doctrine. British Naval Thinking at the Close of the Twentieth Century.' In *The Development of British Naval Thinking*, edited by Geoffrey Till, 182-91. New York: Routledge, 2006.

- . 'The Naval Aviation Controversy 1919-1939.' In *Dreadnought to Daring: 100 Years of Comment, Controversy and Debate in The Naval Review*, edited by Peter Hore, 113–27. Barnsley: Seaforth Publishing, 2012.
- Hackmann, W. D. 'Burney, Sir (Charles) Dennistoun, Second Baronet (1888-1968), Marine and Aeronautical Engineer.' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.
- Harding, Richard. 'The Long Shadow of the Dardanelles on Amphibious Warfare in the Royal Navy.' In *Dreadnought to Daring: 100 Years of Comment, Controversy and Debate in The Naval Review*, edited by Peter Hore, 83–94. Barnsley: Seaforth Publishing, 2012.
- Harper, H. J. C. 'The Development of the Flying Boat.' *Journal of the Royal United Services Institution*. Vol. 82. No. 526 (1937): 359–66.
- Hart, J. F. 'Airship Work for the Navy, 1914-1918.' *Journal of the Royal United Services Institution*. Vol. 70. No. 479 (1925): 499–508.
- Harvey, A. D. 'Subjective Impressions in the Archives: Britain's National Archives as a Source for Personal Accounts, and Personal Opinions, of Air Warfare 1914-1918.' *Cross & Cockade International Journal*. Vol. 45. No. 3 (Autumn 2014): 204.
- Higham, Robin. 'The Peripheral Weapon in Wartime: A Case Study.' In *Naval Warfare in the Twentieth Century 1900-1945*, edited by Gerald Jordan. London: Croom Helm, 1977.
- Hobbs, David. 'The First Pearl Harbor: The Attack by British Torpedo Planes on the German High Seas Fleet Planned for 1918.' In *Warship 2007*, edited by Antony Preston, John Jordan, and Stephen Dent, 29–38. Naval Institute Press, 2007.
- Howlett, Alexander. 'The Royal Naval Air Service and Anti-Submarine Warfare in the North Sea, 1917 – 1918.' *British Journal of Military History*. Vol. 4. No. 2 (2018): 32-49.
- James, W. M., and Andrew Lambert. 'Bayly, Sir Lewis (1857-1938), Naval Officer.' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.
- Jordan, David. 'The Genesis of Modern Air Power: The RAF in 1918.' In *Changing War: The British Army, the Hundred Days Campaign and The Birth of the Royal Air Force, 1918*, edited by Gary Sheffield and Peter Gray, Kindle ebook, Chapter 10. Birmingham War Studies. London: Bloomsbury, 2013.
- Kender, Martin. 'The *Manica* and the Foundation of the British Kite Balloon Service.' *Cross & Cockade International Journal*. Vol. 31. No. 4 (Winter 2000): 223–28.
- King-Hall, W. S. 'The Influence of the Submarine in the Naval Warfare of the Future.' *Journal of the Royal United Services Institution*. Vol. 64. No. 455 (August 1919): 359–81.
- Lambert, Andrew. 'Scott, Sir Percy Moreton, First Baronet (1853-1924), Naval Officer and Engineer.' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.
- . 'Sir Julian Corbett and the Naval War Course.' In *Dreadnought to Daring: 100 Years of Comment, Controversy and Debate in The Naval Review*, edited by Peter Hore, 37–52. Barnsley: Seaforth Publishing, 2012.
- . 'The Naval War Course, Some Principles of Maritime Strategy and the Origins of "The British Way in Warfare."' In *The British Way in Warfare: Power and the International System, 1856-1956*, by Greg Kennedy and Keith Neilson, 219–56, Ebook. Burlington, Vermont: Ashgate Publishing Company, 2010.

- Layman, Richard. 'HMS Ark Royal - 1914-1922.' *Cross & Cockade International Journal*. Vol. 18. No. 4 (Winter 1987): 145–57.
- . 'Hugh Williamson and the Development of the Aircraft Carrier.' *Cross & Cockade International Journal*. Vol. 13. No. 2 (Summer 1982): 70–73.
- Luck, Christopher. 'The Smuts Report: Interpreting and Misinterpreting the Promise of Air Power.' In *Changing War: The British Army, the Hundred Days Campaign and The Birth of the Royal Air Force, 1918*, edited by Gary Sheffield and Peter Gray, Kindle ebook, 149–71. Birmingham War Studies. London: Bloomsbury, 2013.
- Mahoney, Ross and Michael Molkentin, 'Introduction – The Cavalry of the Clouds? New Research in the Development and Experience of Air Power in the British Empire during the First World War'. In *The British Journal of Military History*. Vol. 4. No. 2 (2018): 2-7.
- Marder, Arthur. 'The Dardanelles Revisited: Further Thoughts on the Naval Prelude.' In *Dreadnought to Polaris: Maritime Strategy since Mahan*, edited by A. M. J Hyatt, 30–47. Vancouver: The Copp Clark Publishing Company, 1973.
- McBride, Keith. "'The Hatbox': HMS Argus." In *Warship 1994*, edited by John Roberts, 71–87. London: Conway Maritime Press, 1994.
- McCluskey, Alistair. 'The Battle of Amiens and the Development of British Air-Land Battle, 1918-45.' In *Changing War: The British Army, the Hundred Days Campaign and The Birth of the Royal Air Force, 1918*, edited by Gary Sheffield and Peter Gray, Kindle ebook, Chapter 12. London: Bloomsbury, 2013.
- Newman, Grant. 'Pioneering Torpedo Training at East Fortune 1918.' *Cross & Cockade International Journal*. Vol. 36. No. 3 (Autumn 2005): 143–52.
- Padfield, Peter. 'The Submarine as Commerce Raider.' In *Dreadnought to Daring: 100 Years of Comment, Controversy and Debate in The Naval Review*, edited by Peter Hore, 95–111. Barnsley: Seaforth Publishing, 2012.
- Parton, Neville. 'The Development of Early RAF Doctrine.' *The Journal of Military History*. Vol. 72. No. 4 (October 2008): 1155–78.
- Pugh, James. 'Oil and Water: A Comparison of Military and Naval Aviation Doctrine in Britain, 1912-1914.' In *A Military Transformed? Adaptation and Innovation in the British Military, 1792-1945*, edited by M. LoCicero, R. Mahoney, and S. Mitchell, 124–38. Solihull: Helion, 2014.
- Richards, Dennis. 'Maitland, Edward Maitland (1880-1921), Air Force Officer and Developer of Airships and Parachutes.' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.
- Robinson, Douglas H. 'Zeppelin Intelligence.' *Aerospace Historian*, March 1974.
- Rodger, N. A. M. 'Ballard, George Alexander (1862-1948), Naval Officer.' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.
- Roskill, Stephen. 'The Dismissal of Admiral Jellicoe.' *Journal of Contemporary History*. Vol. 1, No. 4 (October 1966): 69–93.
- Sainsbury, A. B. 'Bacon, Sir Reginald Hugh Spencer (1863-1947).' *The Oxford Dictionary of National Biography*. Oxford University Press, 2004.
- Smith, Alan. 'From Sail to Wing - The Career of Air Chief Marshal Sir Frederick Bowhill.' *Cross & Cockade*

- International Journal*. Vol. 25. No. 1 (1994): 1–17.
- Sueter, Murray. 'ESSAY. Third Place. Subject:- "In the Existing State of Development of War-Ships and of Torpedo and Submarine Vessels, in What Manner Can the Strategical Objects, Formerly Pursued by Means of Blockading an Enemy in His Own Ports, Be Best Attained?"' *Journal of the Royal United Services Institution*. Vol. 48. No. 2 (July 1, 1904): 757.
- Swann, Oliver. 'Naval Air Requirements.' *Naval Review Journal*. Vol. 7. No. 3 (1919): 305-13.
- Sweetman, John. 'The Smuts Report of 1917: Merely Political Window-Dressing?' *Journal of Strategic Studies*. Vol. 4. No. 2 (1981): 152–74.
- Thring, W. H. C. S. 'A Defence Organisation for the British Nations.' *Naval Review Journal*. Vol. 9. No. 1 (1921): 7.
- Turpin, Brian J. 'Coastal Patrol Airships, 1915-1918.' *Cross & Cockade International Journal*. Vol. 15, No. 2 (Summer 1984): 63-71.
- Ventry, Lord. 'British Naval Non-Rigid Airships, 1914-1918.' *Naval Review Journal*. Vol. 46. No. 1 (January 1958): 26–33.
- Woodman, Richard. 'The Problems of Convoys, 1914-1917.' In *Dreadnought to Daring: 100 Years of Comment, Controversy and Debate in The Naval Review*, edited by Peter Hore, 53–66. Barnsley: Seaforth Publishing, 2012.